
SYSTEMATICS OF THE GENUS *MENTZELIA* (LOASACEAE) IN SOUTH AMERICA¹

Maximilian Weigend²

ABSTRACT

South American taxa of *Mentzelia* L. (Loasaceae) are revised and morphologically and ecologically characterized on the basis of extensive field studies, cultivation of several taxa, and a revision of over 1000 herbarium specimens (over 550 collections). On the basis of this study, a total of 14 taxa in eight species and six subspecies are recognized: *M. albescens* (Gillies ex Arn.) Griseb., *M. aspera* L., *M. bartonioides* (C. Presl) Urb. & Gilg, *M. heterosepala* Weigend & E. Rodr., *M. parvifolia* Urb. & Gilg ex Kurtz, and *M. scabra* Kunth, plus the two new species *M. sericea* Weigend (northern Peru) and *M. angurate* Weigend (central Peru). The latter are segregated from *M. scabra*, which is redefined. *Mentzelia scabra* is subdivided into six subspecies: one represents the autonym (subsp. *scabra*, Colombia), four are new status and combinations (subsp. *cordobensis* (Urb. & Gilg ex Kurtz) Weigend [Argentina], subsp. *grandiflora* (Ruiz & Pav.) Weigend [coastal Peru], subsp. *atacamensis* (Urb. & Gilg) Weigend [northern Chile], subsp. *chilensis* (Gay) Weigend [Venezuela, Colombia, Ecuador, Peru, Chile, Bolivia]), and one is a new subspecies (subsp. *boliviana* Weigend [Bolivia]). Lectotypes are designated for *M. andina* Urb. & Gilg, *M. cordifolia* Dombey ex Urb. & Gilg, *M. fragilis* Huber, *M. grisebachii* Urb. & Gilg, *M. parvifolia*, *M. scabra* subsp. *atacamensis*, *M. scabra* subsp. *chilensis*, *M. soratensis* Urb. & Gilg, and *M. scabra* subsp. *cordobensis*. The following taxa are newly synonymized: *M. pinnatifida* (Phil.) Urb. & Gilg (= *M. bartonioides*), *M. jujuyensis* Sleumer and *M. parvifolia* var. *transiens* Sleumer (= *M. parvifolia*), *M. cordifolia* (= *M. scabra* subsp. *grandiflora*), and *M. fendleriana* Urb. & Gilg, *M. ignea* (Phil.) Urb. & Gilg, and *M. soratensis* (= *M. scabra* subsp. *chilensis*). Taxon delimitations in *M. scabra* and its allies have traditionally been based on stamen number, petiole length, petal length, leaf subdivision, seed morphology, and density of trichome cover on stem, all of which are of limited systematic usefulness. Taxa are redefined here primarily on the basis of trichome characters on the ovary, a rather conservative (within and between populations) and readily observed character complex, and additionally on the basis of growth habit, presence or absence of persistent bark, and, at an infraspecific level, fruit shape and petal length. *Mentzelia parvifolia* from southern Peru is reported here for the first time.

Key words: Andes, Loasaceae, *Mentzelia*, South America.

The genus *Mentzelia* L. is the second largest genus of the family Loasaceae, comprising over 80 species (the largest genus is primarily South American *Nasa* Weigend, with ca. 100 species; Weigend, 2004). *Mentzelia* is widespread in the Americas, but has its center of diversity in the southwestern part of North America. Only a single weedy species is found outside the New World: *M. aspera* L. is an introduced weed, e.g., on the Cape Verde Islands (Pinto-Basto, 1995). The vast majority of species are from semi-desert habitats and dry scrub, with only very few taxa entering more permanently humid habitats.

There have been several complete revisions of the genus (Urban & Gilg, 1900; Darlington, 1934), some

revisions for particular geographical regions (Macbride, 1941; Sleumer, 1955; Ernst & Thompson, 1963; Weigend, 2000, 2001), and descriptions of individual taxa from the United States and Mexico (e.g., Thompson & Zavortnik, 1968; Thompson & Roberts, 1971; Turner & Hempel, 1995; Holmgren & Holmgren, 2002; Reveal, 2002;), but only two species have been described from South America (Sleumer, 1955; Weigend & Rodriguez, 1999) since the revision by Urban and Gilg (1900). While a total of ca. 200 species and infraspecific names have been published in *Mentzelia*, many of them have since been reduced to synonymy, including many names originally published by Urban and Gilg (1900). There is

¹ I would like to express my sincere gratitude to the directors of the following herbaria for access to their material: AA, B, BM, BR, CEPEC, COL, CPUN, CUZ, E, F, FR, G, GB, GOET, GUAY, HAO, HUSA, HUT, K, LOJA, LPB, M, MO, MOL, MSB, NY, P, PSO, QCA, QCNE, S, UC, UMSA, US, USM, W, WIS, WU, Z. I want to thank T. Hofreiter, M. Binder, T. Franke, and Dr. H. Förther (Munich, Germany); N. Dostert, T. Henning, and C. Schneider (Berlin, Germany); E. Rodriguez R. (Trujillo, Peru); F. Cáceres H., and V. Quipuscoa S. (Arequipa, Peru); J. Albán C. and A. Cano E. (Lima, Peru); S. Tillett (Caracas, Venezuela); B. Rodriguez (Cali, Colombia); and my wife Katja Weigend for help in the field and additional collections. I want to thank A. Bleyer for providing the line drawings, Michaela Achatz for technical assistance, and H. Lünser for arranging the photographic plates. The funds kindly provided by the following institutions at various stages of the project are here gratefully acknowledged: Studienstiftung des Deutschen Volkes (1992–1997), Deutscher Akademischer Austauschdienst (1999–2000), Deutsche Forschungsgemeinschaft (grant WE 2330/1, 2001–2003), Lewis B. and Dorothy Cullman Laboratory for Molecular Systematics Studies at the New York Botanical Garden (1999–2000), and boteconsult GmbH (1999–present).

² Institut für Biologie–Systematische Botanik und Pflanzengeographie, Freie Universität Berlin, Altensteinstr. 6, D-14195 Berlin, Germany. weigend@zedat.fu-berlin.de.

scattered information on various aspects of the morphology, anatomy, and floral biology of *Mentzelia* (Urban, 1892; Gilg, 1925; Booth, 1933; Leins & Winhard, 1973; Hill, 1976; Brown & Kaul, 1981; Keeler, 1981; Eisner et al., 1998; Spackman Panjabi, 2004), but none of these studies deal with South American taxa. *Mentzelia* is subdivided into a total of four sections, all of which are found in North America and three of which, *Mentzelia*, *Trachyphytum* Torr. & A. Gray, and *Bartonia* Torr. & A. Gray, have native representatives in South America (Darlington, 1934). The genus *Mentzelia* has been the subject of two phylogenetic studies (Hill, 1976; Hufford et al., 2003), both of which largely retrieve the sections recognized by Urban and Gilg (1900) and Darlington (1936) as natural groups. *Mentzelia* section *Mentzelia*, the most speciose group in South America (eight species are recognized here), appears to be one of the two basal lineages, whereas the other two sections present in South America (*Bartonia* and *Trachyphytum*) are among the more derived groups in the genus and clearly have their center of diversification in North America. Section *Bartonia* is represented by a single biennial, herbaceous species in South America, *M. albescens* (Gillies ex Arn.) Griseb., which is also found in North America. Section *Trachyphytum* includes some four annual species from Chile and Argentina (Urban & Gilg, 1900; Darlington, 1934). *Mentzelia* sect. *Mentzelia* is the largest group of *Mentzelia* in South America with a total of 28 species and infraspecific names published. The two previous complete revisions of the genus *Mentzelia* were based on very little material of *Mentzelia* in South America: Urban and Gilg (1900) had seen eight collections of *Mentzelia* sect. *Trachyphytum* and divided these into four species, whereas Darlington (1934) had seen one specimen and three photographs of specimens and recognized three species. Similarly, Urban and Gilg (1900) and Darlington (1934) had seen only 44 and 40 specimens, respectively, of the *Mentzelia hispida* Willd. group, in which they recognized 10 and nine taxa, respectively. Neither of the two studies included any observations in the field or of living plants in cultivation. The morphological differences that have been used in identifying species in South America are mainly seed morphology (winged seed vs. wingless seed), petiole length (lamina sessile vs. distinctly petiolate), number of anthers (70 to 80 vs. 100 to 120), leaf dissection (deeply lobed vs. subentire; Urban & Gilg, 1900), and petal length (Darlington, 1934). The present study focuses on investigating taxon limits on the basis of field observation, cultivated plants, and the revision of herbarium specimens to verify which, if any, of these characters are systematically useful in defining taxa. The classification provided here should

be seen as a broadly based morphological hypothesis inviting further studies, especially those using molecular techniques, to elucidate the phylogeny of the group. The revised classification proposed in the following descriptions recognizes only eight South American species, one each in *Mentzelia* sect. *Bartonia* (*M. albescens*) and *Mentzelia* sect. *Trachyphytum* (*M. bartonioides* (C. Presl) Urb. & Gilg), and six in *Mentzelia* sect. *Mentzelia* (*M. angurate* Weigend [new species], *M. aspera*, *M. heterosepala* Weigend & E. Rodr., *M. parvifolia* Urb. & Gilg ex Kurtz, *M. scabra* Kunth, and *M. sericea* Weigend [new species]). A total of six subspecies are recognized in *M. scabra* (subsp. *atacamensis* (Urb. & Gilg) Weigend [new status and combination], subsp. *boliviana* Weigend [new subspecies], subsp. *chilensis* (Gay) Weigend [new status and combination], subsp. *cordobensis* (Urb. & Gilg ex Kurtz) Weigend [new status and combination], subsp. *grandiflora* (Ruiz & Pav. ex G. Don) Weigend [new status and combination]; and subsp. *scabra*).

MATERIAL AND METHODS

Plant material and observations were derived from a total of 11 field trips to South America (Argentina, Chile, Colombia, Ecuador, Peru, and Venezuela). These led to over 60 collections of *Mentzelia*, typically including seed material, formalin acetic alcohol-preserved material, and photographs. Field observations were made on seven of the eight species recognized here and on four of the five subspecies of *M. scabra*. Over 1000 herbarium specimens (over 550 collections) of *Mentzelia* from South America were revised, including most extant nomenclatural types from the following 39 herbaria: AA, B, BM, BR, CEPEC, COL, CPUN, CUZ, E, F, FR, G, GB, GOET, GUAY, HAO, HUSA, HUT, K, LOJA, LPB, M, MO, MOL, MSB, NY, P, PSO, QCA, QCNE, S, UC, UMSA, US, USM, W, WIS, WU, Z. Six different seed lots of three taxa (*M. heterosepala*, *M. sericea*, *M. scabra* subsp. *chilensis*) were germinated and cultivated until fruit maturity in the green houses at Berlin.

MICROSCOPY

For scanning electron microscopy (SEM), the plant material was either mounted directly (seeds, pollen) or critical point-dried after dehydration in a graded alcohol series following the standard procedure (flowers, fruits). Material was then sputter-coated with gold and subsequently viewed and photographed in an LEO VP 438 scanning electron microscope (Leo Electron Microscopy Ltd., Cambridge, United Kingdom) at a voltage of 15 kV.

RESULTS

MORPHOLOGY

Most South American *Mentzelia* species are caulescent plants that already have well-spaced leaves in the seedling stage; only *M. bartonioides* and *M. albescens* have a distinct basal leaf rosette. *Mentzelia bartonioides*, *M. aspera*, and *M. parvifolia* are annuals, and *M. albescens* is biennial. *Mentzelia sericea*, *M. angurate*, and the subspecies of *M. scabra* are typically subshrubs, but can flower and fruit in the first season (i.e., facultatively annuals). *Mentzelia heterosepala* and *M. scabra* subsp. *scabra* are clearly shrubs, a growth habit also occasionally found in *M. scabra* subsp. *chilensis* and *M. sericea*. The flowers of *Mentzelia* sect. *Mentzelia* are always heterochlamydeous and pentamerous. The sepals are shorter than the petals, narrowly ovate, and usually long-acuminate and more or less homogeneous. Only *M. heterosepala* has two larger outer sepals, followed by one sepal of intermediate size and two narrower inner sepals. The petals are always widely ovate, obovate or subcircular, and acuminate. They are off-white to pale yellow in *M. albescens* and yellow to orange in all other South American species. The androecium consists of numerous anthers (20 to 120), but the exact number is not fixed and the primary flowers have distinctly more stamens than the secondary and higher-order flowers, which renders a species distinction on the basis of simple stamen number (Gilg, 1893; Urban & Gilg, 1900; Darlington, 1934) extremely problematic. While the maximum number of stamens differs between *M. scabra* subsp. *scabra* and *M. scabra* subsp. *chilensis*, there is broad overlap between late flowers of the former and primary flowers of the latter. Stamen number is therefore not used here as a systematic criterion. Variability of stamen numbers has already been documented by Brown and Kaul (1981) for other species in *Mentzelia*.

Some degree of heteranthery is nearly universally present in *Mentzelia*, ranging from slight size differences (outer and especially antesepalous stamens with longer filaments) to increasingly divergent outer/antesepalous filaments (Urban, 1886, 1892; Urban & Gilg, 1900; Darlington, 1934; Brown & Kaul, 1981). In *M. bartonioides*, the antesepalous filaments are often distinctly widened in their proximal half, and this has been used to distinguish between species by Urban and Gilg (1900), but has been shown to be inconsistent within and between individuals by Sleumer (1955), who consequently synonymized the species differentiated on the basis of this character. Similarly, *M. aspera* typically has antesepalous stamens with petaloid filaments, but many populations (Fig. 4A; Weigend et al. 8421,

8516) have uniformly filiform filaments; thus, this character seems to be useless for the purposes of classification. In *M. heterosepala*, *M. scabra*, *M. angurate*, and *M. sericea*, the ca. 10 outer filaments are usually much longer (1.5–2×) than the inner filaments, such that an outer series of anthers distinctly overtops the inner anthers, which, in turn, form a more or less tight fascicle in the center of the flower, at least in early anthesis. This phenomenon was first illustrated in Ruiz and Pavón (1958: 457, “*Mentzelia fulva*” = *M. scabra* subsp. *grandiflora*) and is also found in many other species of *Mentzelia* sect. *Mentzelia* outside South America (U.S.A.: *M. oligosperma* Nutt., N.C. Henderson 63-972 (FR); *M. floridana* Nutt., A. H. Curtiss 959 (FR); and Mexico: *M. hispida* Willd., W. Boege 1445 (FR)). Loasaceae usually have ring nectaries or antesepalous groups of secretory stomata (Thompson & Ernst, 1967; Brown & Kaul, 1981; Weigend, 1997). Ring nectaries are present in *M. albescens*, as has been previously reported (Urban, 1886, 1892), but nectaries and nectar production are absent in all taxa of *Mentzelia* sect. *Mentzelia* (*M. aspera*, *M. angurate*, *M. heterosepala*, *M. parvifolia*, *M. scabra*, and *M. sericea*) in South America. Pollen is the only pollinator reward.

The capsules of *Mentzelia* sect. *Mentzelia* are sessile to shortly pedicellate. Fruit dehiscence is usually by three apical valves, but additionally, the calyx and sometimes the entire ovary roof are often shed at maturity in *M. aspera* and *M. parvifolia*. In these latter taxa, the seeds usually fail to fall out of the capsule through the small apical opening, but remain trapped in the fruit until the capsule wall disintegrates. Otherwise dehiscence is reversibly xerochastic, as is typical of most Loasaceae (Weigend et al., 2004). The fruits remain firmly attached to pedicel and plant in *M. albescens*, *M. aspera*, *M. bartonioides*, *M. heterosepala*, and *M. parvifolia*, but the fruit can also break off when they come into contact with the fur/clothing of a passing mammal and are then dispersed as a unit in some taxa (e.g., *M. scabra* and subspecies).

Scabrid glochidiate trichomes come in many shapes in Loasaceae and are often good taxonomic markers (Dostert & Weigend, 1999). In *Mentzelia* the entire above-ground parts of the plant (with the exception of the petals, stamens, style, and sometimes the ovary roof) are covered with these trichomes. In *Mentzelia* sect. *Mentzelia*, the indumentum of the fruits is one of the very few characters that is stable not only within populations, but also in groups of populations, and correlates well with geographical distribution, as well as with habit and (often) leaf dissection. Moreover, the characters are readily defined and observed with a hand lens, so they appear ideally suited for taxon

delimitation. Individual trichomes consist of an apical unicellular trichome-cell and a group of five to 18 basal cells that are often elevated above the epidermis, especially in large trichomes (Fig. 1C, D). The distinction between scabrid and glochidiate trichomes depends on the nature of the surface sculpturing. If sculpturing is blunt or acroscopically curved and relatively short (less than shaft diameter, Fig. 1C), the trichomes are termed scabrid, and in this case, the trichome apex is usually tapering and smooth. If the sculpturing is basiscopically curved and longer (at least some equaling the shaft diameter, Fig. 1D), the trichomes are called glochidiate. Typically, the glochidiate trichomes have a ring of long projections at the tip, giving them the appearance of an anchor, which is why the term “ankerhaare” (anchor trichomes) has been used in the literature (Fig. 4B–D; Solereder, 1899). All parts of the plants are covered with scabrid and/or glochidiate trichomes, but only a comparison for the outside of the ovary/capsule is illustrated here. The differences here are particularly striking and more clearly observed than on the leaves and stem, and are therefore used in taxon delimitation in *Mentzelia* sect. *Mentzelia*.

Seeds. The seed morphology of *Mentzelia* in North America has been studied in some detail by Hill (1976), who showed that seed morphology largely supports the infrageneric groups proposed by Urban and Gilg (1900) and Darlington (1934). The seeds of *M. albescens* (Fig. 1E, F) are very similar to those of other taxa in section *Bartonia*, as are those of *M. bartonioides* (Fig. 5D, E) to other taxa of section *Trachyphytum* illustrated in Hill (1976). The seeds of the taxa of *Mentzelia* sect. *Mentzelia* studied here (*M. aspera*: Fig. 4E, F; *M. angurate*, *M. heterosepala*: Fig. 6D–F; *M. parvifolia*: Fig. 8E, F; and *M. sericea*: Fig. 17D, E) are irregularly oblique-ovoidal, laterally compressed, and have irregularly oblong testa epidermis cells with shallow (e.g., *M. scabra*, *M. heterosepala*) or deep (e.g., *M. parvifolia*) transverse (equatorial) grooves or striations. This seed morphology corresponds closely to that of North American taxa of *Mentzelia* sect. *Mentzelia* (Hill, 1976). The winged seeds used to distinguish taxa by Urban and Gilg (1900) are an artifact: immature seeds collapse strongly and then appear to have a narrow longitudinal wing, while none of the taxa have winged seeds when mature.

TAXONOMIC TREATMENT

KEY TO *MENTZELIA* IN SOUTH AMERICA

- 1a. Erect, annual or biennial herbs with distinct basal leaf rosette (usually withered when plant is in flower), leaves narrowly obovate to oblong, sinuate to pinnatifid.
 - 2a. Annual herbs; flowers with 5 (small) petals; seeds irregularly and sharply angular (sect. *Trachyphytum*) . . . 4. *M. bartonioides*
 - 2b. Biennial herbs; flowers seemingly with 10 petals (5 petals and 5 petaloid staminodia); seeds flat and disc-shaped with wide marginal wing (sect. *Bartonia*) . . . 1. *M. albescens*
- 1b. Laxly branched herbs, shrubs or subshrubs with long, leafy stems, basal leaf rosette never present; leaves (widely) ovate, typically with 1 large leaf lobe on each side, rarely leaves subentire . . . *Mentzelia* sect. *Mentzelia*
 - 3a. Annual herbs; ovary covered with glochidiate trichomes only; bracts of terminal flowers recaulescent on axillary branches (when present), sometimes to the next flower; capsule cylindrical to narrowly clavate, sessile or subsessile with barely narrowed base.
 - 4a. Inflorescence branches divergent with an angle of ca. 90°; leaves with 1 distinct lobe near the base on each side, margin ± regularly serrate; mature capsules 18–25 mm long, narrowed at base . . . 3. *M. aspera*
 - 4b. Inflorescence branches divergent with an angle of ca. 160°–180°; leaves indistinctly lobed, sometimes pinnately lobed, sometimes with a single lobe on each side, that lobe then with a distinct proximal lobule, margin irregularly serrate to lobulate; mature capsules 8–14 mm long, not narrowed at base but often somewhat narrowed ca. 1/3 from base . . . 6. *M. parvifolia*
 - 3b. Shrubs or subshrubs, rarely annual shrubs; ovary covered with both scabrid and glochidiate trichomes, or with scabrid trichomes only; bracts not or only slightly recaulescent; capsule subglobose to (rarely) widely clavate, pedicellate, subglobose if subsessile.
 - 5a. Leaves subentire or entire; sepals distinctly different in width; inflorescence few-flowered with 1 to 3 flowers, rarely many-flowered (4 to 10) and compact (subterminal branches only slightly overtopping primary flower) . . . 5. *M. heterosepala*
 - 5b. Leaves always serrate and usually lobed; sepals ± identical in width (outer ones at most 1.5× as wide as inner ones); inflorescence many-flowered (> 20), diffuse, subterminal branches far overtopping primary flower.
 - 6a. Indument of ovary consisting of scabrid and glochidiate trichomes of widely differing lengths . . . 7. *M. scabra*
 - 6b. Indument of ovary consisting only of scabrid trichomes of similar lengths.

- 7a. Ovaries and capsules widely ovoidal to subglobose, densely covered with yellow, acroscopic to half-erect, scabrid trichomes 1.5–2 mm long; decumbent to ascending subshrub . . . 2. *M. angurate*
7b. Ovaries and capsules conical to narrowly ovoidal, densely covered with white, appressed scabrid trichomes up to 0.5 mm long; stiffly erect subshrub or shrub 8. *M. sericea*

Mentzelia L., Sp. Pl. 1: 516. 1753. TYPE: *Mentzelia aspera* L., Sp. Pl. 1: 516. 1753.

Bartonia Pursh ex Sims, Bot. Mag. 36: t. 1487. 1812, nom. illeg., non *Bartonia* Mühl. ex Willd., Gentianaceae, 1801. *Nuttallia* Raf., Amer. Monthly Mag. 1: 358. 1817. *Hesperaster* Cockerell, Torrey 1: 142. 1901, nom. illeg. TYPE: *Bartonia decapetala* Pursh ex Sims [= *Mentzelia decapetala* (Pursh ex Sims) Urb. & Gilg].

Torreyia Eaton, Man. Bot., ed. 5: 420–421. 1829, nom. rej., non *Torreyia* Arn., Taxaceae, 1838, nom. cons. TYPE: *Torreyia ornata* (Pursh ex Sims) Eaton, nom. illeg. [= *Mentzelia ornata* (Pursh ex Sims) Torr. & A. Gray].

Acrolasia C. Presl, Reliq. Haenk. 2: 39. 1831. TYPE: *Acrolasia bartonioides* C. Presl [= *Mentzelia bartonioides* (C. Presl) Urb. & Gilg in Engl. & Prantl].

Creolobus Lilja, Fl. Sv. Odl. Vext.: 67. 1839. *Chrysostoma* Lilja, Fl. Sv. Odl. Vext. Suppl. 1: 33. 1840, nom. illeg. TYPE: *Creolobus aureus* Lilja.

Bicuspidaria Rydb., Bull. Torrey Bot. Club 30: 275. 1903. TYPE: *Bicuspidaria tricuspis* (A. Gray) Rydb.

Annual or perennial herbs, subshrubs, shrubs, or small trees with scabrid-glochidiate trichomes, without stinging hairs, dominant and persistent taproot present. Leaves sessile or petiolate, opposite below and alternate above, rarely opposite or alternate throughout; lamina ovate to triangular-ovate, occasionally lyrate, usually lobed, margin serrate or mucronate. Inflorescences complex, terminal, basitonic thyrsoids, frondose, bracteose or frondose-bracteose; each flower with 2 frondose prophylls; sepals green, triangular or ovate, acuminate, margin entire; flowers with inferior ovary, calyx lobes ovate, acuminate or apiculate, white, yellow, or orange; stamens 10–120, filaments equal to very unequal in size, sometimes outer filaments dilated or apically forked, or petaloid staminodes; style 1, filiform, stigmatic surfaces long-decurrent on style. Capsule inferior, sessile or pedicellate, opening with 3 to 7 apical valves; seeds angular or laterally compressed; testa reticulate or polyhedral, sometimes with central papillae, sometimes narrowly winged.

Distribution and habitat. Ca. 80 species, from Argentina to Canada including the Caribbean and Galápagos Islands, most in the southwestern U.S.A. and Mexico. The majority of species are in desert and semi-desert habitats, some penetrating into grasslands and tropical dry forests.

1. *Mentzelia albescens* (Gillies ex Arn.) Griseb., Abh. Königl. Ges. Wiss. Göttingen Math.-Phys.

Kl. 19: 150. 1874. Basionym: *Bartonia albescens* Gillies ex Arn., Edinburgh J. Nat. Geogr. Sci. 3: 273. 1831. TYPE: Argentina, Mendoza, *J. Gillies s.n.* (holotype, BM!; isotypes, E!, K not seen). Figure 1.

Bartonia sinuata C. Presl, Reliq. Haenk. 2: 38. 1831. TYPE: Chile. *T. P. X. Haenke s.n.* (type, PR not seen).

Biennial herb 0.1–0.85 m tall, forming a dense leaf rosette in the first year and a much-branched, stiffly erect flowering shoot in the second year; stems basally 5–15 mm thick, shoot densely branched, with a single, little-branched taproot; stem off-white, densely covered with glochidiate trichomes. Leaves subsessile with long-tapering base, basal leaves numerous in dense, biennial rosette, upper ones alternate; lamina narrowly obovate, 25–200 × 5–35 mm, sinuate-dentate with rounded lobules; base long-tapering; apex rounded to acuminate. Inflorescences frondose-bracteose, many-flowered (> 15), strongly basitonic, dense and brush-like (branching angle between paraclades of dichasia mostly < 60°); proximal internodes 1–3× as long as subtending bracts, distal internodes much shorter than subtending bracts; bracts ovate, entire to irregularly dentate, 5–50 × 5–25 mm; flowers subsessile. Flowers with calyx tube cylindrical from conical base, 6.5–13 × 3.5–5 mm, densely covered with erect, thin, glochidiate trichomes 0.1–0.6 mm long; calyx lobes 5–6 × 2–3.5 mm, ovate-acuminate; petals widely ovate, 6.5–10 × 2.3–3.5 mm, apex acuminate to apiculate, off-white to pale yellow; petaloid stamens 5, antesepalous, similar in shape, size, and color as petals; fertile stamens 40 to 60, filaments 3–7 mm, outer ones longer than inner ones, anthers ca. 0.6 × 0.4 mm; style filiform, 5.5–7 mm, with 3 decurrent stigmas. Capsule sessile, cylindrical, 5–10 × 3–5 mm, opening with 3 apical valves; seeds 70 to 110, ca. 2.5–3.5 mm wide, flat, disc-shaped with circular wing, white to off-white.

Mentzelia albescens is the only known biennial species of the genus in South America, where it is restricted to Chile and Argentina. It is readily recognized by its flowers that appear to have 10 petals (five petals and five petaloid staminodia), and it is the only South American species of *Mentzelia* sect. *Bartonia*, which has ca. 30 species in North America (Darlington, 1934). *Mentzelia albescens* itself is also found in North America (southern U.S.A., Mexico; Perez-Moreau & Crespo, 1988).

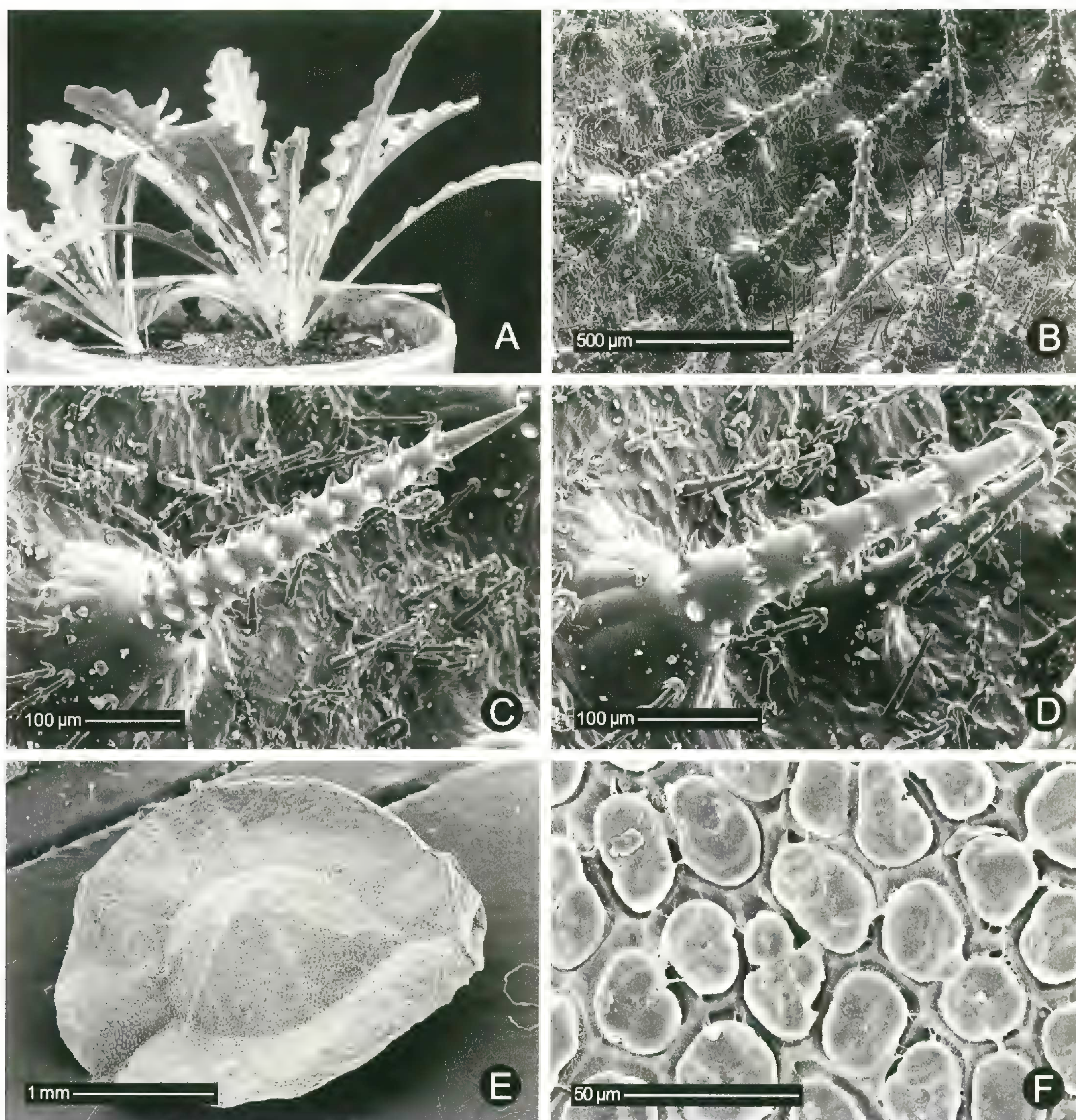


Figure 1. *Mentzelia albescens*. —A. Young plant showing dense rosette of lyrate leaves. B–D. Indumentum on abaxial ovary surface. —B. Overview, mixture of long glochidiate, scabrid, and short glochidiate trichomes. —C. Individual, long scabrid trichome. —D. Individual, long glochidiate trichome. E, F. Seed. —E. Entire seed, note the wing. —F. Detail of testa epidermis. From Weigend *et al.* 6865.

Distribution and habitat. *Mentzelia albescens* grows in dry, semi-desert situations, typically on sand or gravel soils, at elevations of 150–1000 m in Chile and 150–1600 m in Argentina and has also been reported from Argentina, from the province San Luis (Perez-Moreau & Crespo, 1988), and from the provinces La Pampa and Tucumán (Sleumer, 1955), in addition to the provinces listed below.

Additional specimens examined. ARGENTINA. **Catamarca:** Dpto. Capital, Río del Valle, *Venturi* 6071 (MO). **Córdoba:** Córdoba, *Hieronymus* 9888 (BR), *Lorentz* 395

(GOET), *Lorentz* 43 (GOET, M); Río Primero, *Hunziker* 10500 (MO). **Mendoza:** 40 km NW of Mendoza, *Conrad* 2662 (MO); Luján, Cacheute, *Balegno & Barkley* 20MZ.282 (MO). **Neuquén:** Bajo del Marucho, *Schajovsky* 60 (M); Lacar, Pampa de Alicura btw. Confluencia & Alicura, *Weigend et al.* 6865 (B, BRCO, NY); Los Lagos, Cerro Bayo near Villa La Angostura, *Weigend et al.* 6866 (B, BRCO, NY); Picunches, Quebrada Las Lajitas 3 km W of Las Lajas, *Weigend et al.* 6912 (B, BRCO, NY). **Río Negro:** Near General Roca, Río Negro, *Fischer* 61 (MO). **San Juan:** Iglesia, El Rodeo, *Cuezzo* 1843 (WISC); Jachal, rd. to Mogne, *Kiesling* 3008 (MO). CHILE. **IV Región, de Coquimbo:** Rivadavia, *Werdermann* s.n. (MO); Elquí nahe Vicuña, *Vogel* 277 (WU); Río Elquí, 69 km from La Serena, 10 km E of La Vicuña, Quebrada Uchuni, *Rosas* 1428 (M); riverbed near Tololo, *Bayer* 530

(M); Dpto. Ovalle, La Torca, near Tongoy, *Jiles* 528 (M); close to Carén, *Jiles* 4689 (M); Choapa, Choapa valley, 10 km S of Illapel, *Grau* 314 (M). **Province unknown:** *Bridges* s.n. (E), *Gay* s.n. (B).

2. *Mentzelia angurate* Weigend, sp. nov. TYPE: Peru. Lima: Huarochirí, btw. Chosica & Matucana on Carretera Central, 1900 m, *M. Weigend, N. Dostert & K. Drießle* 97/459 (holotype, USM!; isotypes, CPUN!, F!, M!). Figures 2, 3.

Haec species *Mentzeliae scabrae* affinis, sed ab ea ovario trichomatibus scabridis, flavescens, patentis, usque ad 2 mm longis, instructo differt.

Subshrub 0.3–0.6 m tall, decumbent to ascending; stems 5–8 mm thick basally, with pale, strongly exfoliating bark, lignescent, young shoots densely covered with erect scabrid and glochidiate trichomes. Leaves subsessile or shortly petiolate (lower leaves with petioles 2–4 mm); lamina ovate, 20–30(–53) × 18–25(–30) mm, shallowly and irregularly lobed or just deeply serrate; base subcordate to subcuneate; apex acuminate. Inflorescence frondose, lax, widely branched (branching angle between paraclades of dichasia < 90°); internodes 2–4× as long as subtending bracts, bracts 15–20 × 10–15 mm; pedicels 0–1 mm. Flowers with calyx tube subglobose, 4 × 4 mm, densely covered with half-erect to erect, yellow, scabrid trichomes; calyx lobes narrowly ovate and long-acuminate, ca. 10 × 3 mm; petals widely obovate, 18–25 × 8–12 mm, apex apiculate, bright orange; stamens ca. 60, 10 outer ones markedly longer, ca. 13 mm, inner ones 5–6 mm, anthers 1 × 0.7 mm. Capsule globose, 6–8 × 6–8 mm, very densely covered with scabrid trichomes, these acroscopic to appressed, 1200–2000 µm long, pale yellow to beige.

Mentzelia angurate is excellently documented in herbaria, and the main reason why this taxon has been consistently overlooked is that it has usually been identified as *M. cordifolia* Dombey ex Urb. & Gilg (= *M. scabra* Kunth subsp. *grandiflora* (G. Don) Weigend). The descriptions by Urban and Gilg (1900) and Darlington (1934) both note the long trichomes on the ovary (see Fig. 3A, B) and thus agree with this identification; however, the type of specimens of *M. cordifolia* that I reviewed do not match this description. The extant *Dombey* specimens seen in G and P (cited in the protologue of *M. cordifolia*; Urban & Gilg, 1900) lack the long trichomes on the ovary and clearly belong to *M. scabra* subsp. *grandiflora* (see 7.5 below for further details); they were likely collected in the Lomas de Chancay, where *M. angurate* is not found. A distinct and new name is therefore required for the taxon. The characteristic

very long, yellow trichomes on the ovaries make it readily distinguishable. The new species is more or less decumbent and is a smaller subshrub than either typical *M. scabra* or *M. sericea*.

Distribution, habitat, and etymology. The plants are found on steep scree slopes with open vegetation and also on road banks at elevations of 800–3000 m. Its peak flowering time is March to May, with sporadic flowering throughout the year, depending on the availability of moisture. It is largely restricted to the Peruvian departments of Lima and the extreme south of Ancash, and is replaced by *M. scabra* subsp. *chilensis* both north and south of this region. We know of a few populations from Huánuco that may have been dispersed by humans, since the central highway (“Carretera Central,” a main gateway for people and goods for centuries) from Lima to Huánuco connects the province Huarochirí, where the species abounds, with the valley of Huánuco. This conclusion is supported by the fact that at least one other species that is otherwise restricted to the western slope of the Andes is found in this precise region and nowhere else in Andean valleys (*Nasa chenopodiifolia* (Desr.) Weigend). The specific epithet “anguraté” (or “anguaraté”) represents the local name of *Mentzelia* in central Peru.

Paratypes. PERU. **Ancash:** Recuay, Barranca, rd. from Conococha to Pativilca, *M. Weigend, K. Weigend, T. Henning & Ch. Schneider* 5549 (BSB, HUT, M, USM); Bolognesi, 3 km below Chiquián, *R. Ferreyra* 7377 (USM); Bolognesi, 10 km SE of Chiquián, *K. Young & M. Eisenberg* 925 (MO). **Huánuco:** Huánuco, *J. F. Macbride* 3215 (G); Ambo, rd. from Huánuco to Cerro de Pasco, Km 27, 3 km from Ambo, *M. Weigend, K. Weigend, T. Henning & Ch. Schneider* 5465 (BSB, HUT, M, USM); Huánuco, Cerros de Huánuco, *R. Ferreyra* 1572 (USM). **Lima:** Canta, path to Canta, *R. Ferreyra* 8718 (M, USM); near Canta, *R. Ferreyra* 7248 (M, USM); ca. 2 km below Canta, *G. Yarupaitán* 1674 (M, USM); Huarochirí, San Bartolomé, *N. Valencia* 1416 (M, USM); Tambo de Viso, Km 83–84 on Carretera Central, *G. Yarupaitán* 1675 (M, USM); Yaso, *G. Vilcapoma & M. Flores* 1141 (M, MOL); Canta, *R. Ferreyra* 7218 (M, MOL); Tornamesa, btw. Chosica & Surco, *R. Ferreyra* 7030 (M, USM); Surco, Km 74 of Carretera Central, *R. Ferreyra* 4079 (USM); just above (ENE) Surco, Km 72 on Carretera Central, *D. & V. Ugent* 5293 (WIS); Puerta Huarimayo, *G. Vilcapoma* s.n. (M, MOL); Ayasuna, *M. Flores* 180 (M, MOL); Río Chillón, Viscas, *F. W. Pennell* 14472 (K, US, USM); Matucana, *R. Ferreyra* 8286 (M, USM); Canyon of Río Rimac, 6 km above Matucana, *P. Hutchison & M. Ricardi* 4987 (M, USM); betw. Chosica & Matucana on Carretera Central, *M. Weigend, N. Dostert & K. Drießle* 97/459 (F, HUT, M, USM); Surco, Km 74 of Carretera Central, *R. Ferreyra* 4979 (M, USM); Km 70 of Carretera Central, Huarochirí, *Ferreyra* 3489 (USM), *R. Ferreyra & E. Cerrate* 14887 (USM); Huarochirí, rd. Santa Eulalia to San Juan de Iris, *N. Smith & B. León* 1362 (USM); San Bartolomé, *E. Asplund* 10885 (G); Río Rimac, *Ball.* s.n. (K); Matucana, *J. F. Macbride & W. Featherstone* 130 (G); 6 km ENE of Matucana, *D. & V. Ugent* 5297 (K, USM, WIS); Km 69–70

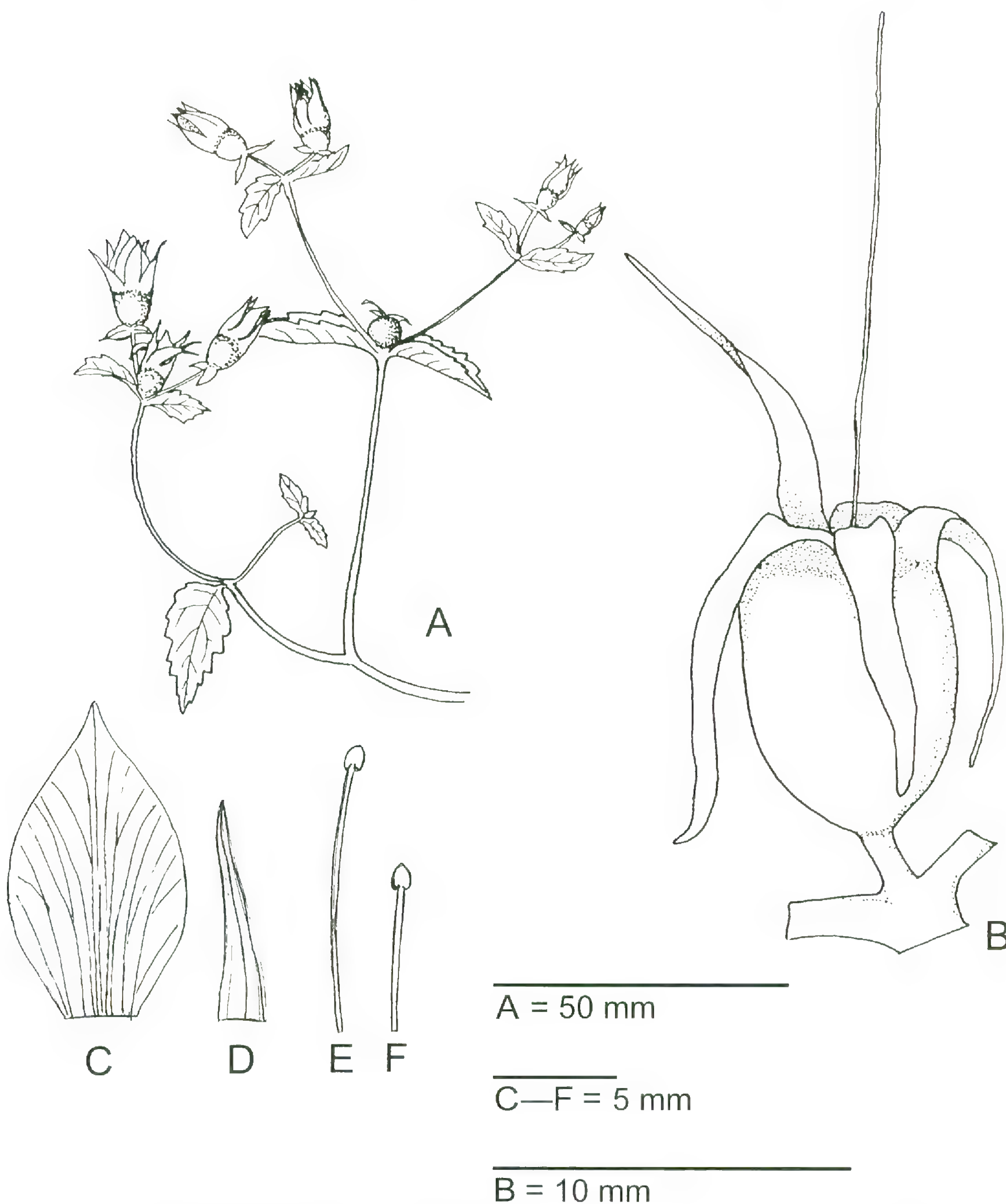


Figure 2. *Mentzelia angurata* Weigend. —A. Inflorescence. —B. Fruit. —C. Petal. —D. Sepal. —E. Outer stamen. —F. Inner stamen. Drawn from *Ugent & Ugent* 5293.

of Carretera Central, near bridge, *R. Ferreyra* 2018 (USM); Tamboraque, Oroya railway, *Sandeman* s.n. (K); Km 70 of Carretera Central, *R. Ferreyra* 14887 (M, USM); near Surco, Oroya, *L. Martinet* 167 (P), *L. Martinet* 939 (P); Matucana, *J. P. Hjerting & E. Petersen* 1229 (USM); Matucana, *A. Weberbauer* 89 (G); btw. Chosica & Matucana on Carretera Central, *M. Weigend, N. Dostert & K. Drießle* 97/459 (F, HUT, M, USM); Chosica, *R. Ferreyra* 6111 (USM); Km 56 on Carretera Central, *R. Ferreyra* 8236 (M, USM), *R. Ferreyra* 590 (USM); Canyon of Río Rimac, 6 km above Matucana, *P. Hutchison & M. Ricardi* 4987 (K, USM); Surco, *P. Nuñez*

1660 (M, MOI); Quebrada San Juan btw. Surco & Matucana, *R. Ferreyra* 5130 (M, USM); S of Matucana along Carretera Central, *G. Sullivan et al.* 835 (MO); Chancay, Sayan, near the ruins, *H. Beltrán* 2 (USM). **Province unknown:** *L. Martinet* 74 (P), *L. Martinet* s.n. (P), *J. McLean* s.n. (K), *P. A. Savatier* s.n. (K).

3. *Mentzelia aspera* L., Sp. Pl. 1: 516. 1753. TYPE: tab. 174, in C. Plumier, *Nov. Pl. Amer.* 1703. Figure 4.

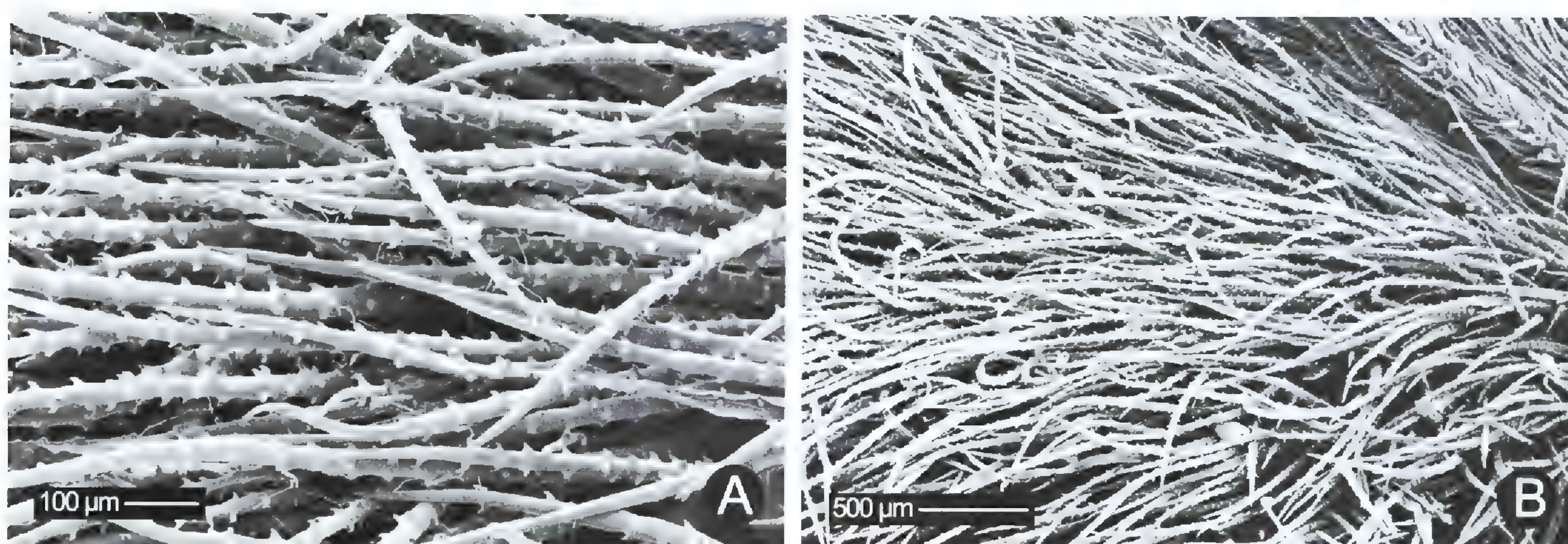


Figure 3. *Mentzelia angurata* Weigend, indumentum on ovary. —A. Overview, indument of scabrid trichomes of more or less equal length. —B. Close-up showing thickly overlapping layers of long, scabrid trichomes (epidermis not visible). From Weigend et al. 5549.

Mentzelia propinqua F. Aresch., Pl. Itin. Eugeniae: 133. 1910. TYPE: Ecuador. [Guayas:] Isla de Puná, *N. J. Andersson 124* (lectotype, designated by Weigend, 2000: 9, S!).

Mentzelia fragilis Huber, Bull. Herb. Boissier, ser. 2, 1: 314. 1901. TYPE: Brazil. Ceará: Quixada reservoir, btw. rocks, *J. Huber s.n.* (lectotype, designated here, G!; isotype, SP not seen).

Mentzelia triloba Ruiz & Pav., Anales Inst. Bot. Cavanilles 16 (Fl. Peruv. 5): 423. 1958. TYPE: tab. 444, fig. a, in Ruiz & Pavón, 1958.

Erect, decumbent or straggling annual herb (0.1–) 0.3–1.5(–2) m tall; stem up to 6 mm thick, densely set with erect glochidiate trichomes 0.6–1 mm long and with scabrid, apically tapering trichomes 0.1–0.3 mm long; stem and branches slightly succulent and extremely brittle. Leaves spirally inserted, petioles 10–40(–80) mm; lamina ovate to triangular-ovate, 40–110(–160) × 20–80(–120) mm; base truncate to cuneate; apex acuminate; margin coarsely serrate, with 1 ovate to oblong lobe on each side, lobes 5–25 × 10–25 mm. Inflorescences as terminal dichasia or thyrsoids, widely branched (branching angle between paraclades of dichasia ca. 90°) with opposite, recaulescent (to the next flower), frondose bracts. Flowers with calyx tube shortly cylindrical, 4–8 × 1.5–2 mm, slightly narrowed at base, with dense cover of glochidiate hairs 50–700 µm long, calyx lobes narrowly ovate to linear, 5–8 × 2 mm; petals widely ovate to subcircular, 5–15 × 2.5–7 mm, base narrowed, apex acute, golden yellow to pale orange; stamens 20 to 30, 10 outer ones with filiform or petaloid filaments, all filaments ca. 5 mm, anthers ca. 1 × 1 mm, ovate to oblong, yellow; style filiform, ca. 5 mm, with 3 decurrent stigmas. Capsule initially erect, then deflexed, narrowly cylindrical and only slightly narrowed at base, 9–25 × 2.5–3.5 mm, covered with glochidiate trichomes, longer ones

500–600 × 100 µm, with 12 to 16 bands of short hooks, short ones rather uniformly 100–130 × 20 µm thick with 5 to 6 bands of short hooks, seeds 6 to 9, irregularly oblong, 2.5–3.5 × 1.5 mm, yellowish gray.

Mentzelia aspera is a widespread and variable species. In semi-desert habitats, the plants may flower when barely reaching 10 cm in height, producing less than five flowers per plant, whereas other individuals have very large leaves (16 × 12 cm) and reach a height of 1.5–2 m (Bolivia, *Fuentes 1519*). The segregate *M. fragilis* proposed for the Brazilian specimen (*J. Huber s.n.*) is not accepted. The Brazilian material studied by this author agrees perfectly with the Andean and Central American specimens. Two possible type specimens are extant, and lectotypification for *M. fragilis* is required. It is here lectotypified on the specimen at G, since the SP specimen was not seen. The specimens from the Galápagos Islands tend to have the smallest leaves of any specimens seen for this revision, and therefore several infraspecific segregates have been proposed for the Galápagos forms (Urban & Gilg, 1900). They are not accepted here because they grade into typical *M. aspera* in other specimens from the Galápagos Islands.

Distribution and habitat. Most collections of the species are from situations where it grows as a weed, but it is also an important component of tropical dry forest and cactus scrub in Peru. It grows from sea level to elevations of 1500(–2000) m, and flowers and fruits whenever sufficient moisture is available.

Additional specimens examined. ARGENTINA: **Salta:** Oran, Misión Zenta, *Sleumer s.n.* (B); Salta, Capital, Cerro San Bernardo, *Novara 2417* (MO), *Novara 2351* (MO). **Tucumán:** Burruyacu, *Venturi 10322* (MO). BOLIVIA. **Cochabamba:** Near Cochabamba, *Bang 1005* (M), *Bang 748* (M). **La Paz:** Bautista Saavedra, Charazani, above

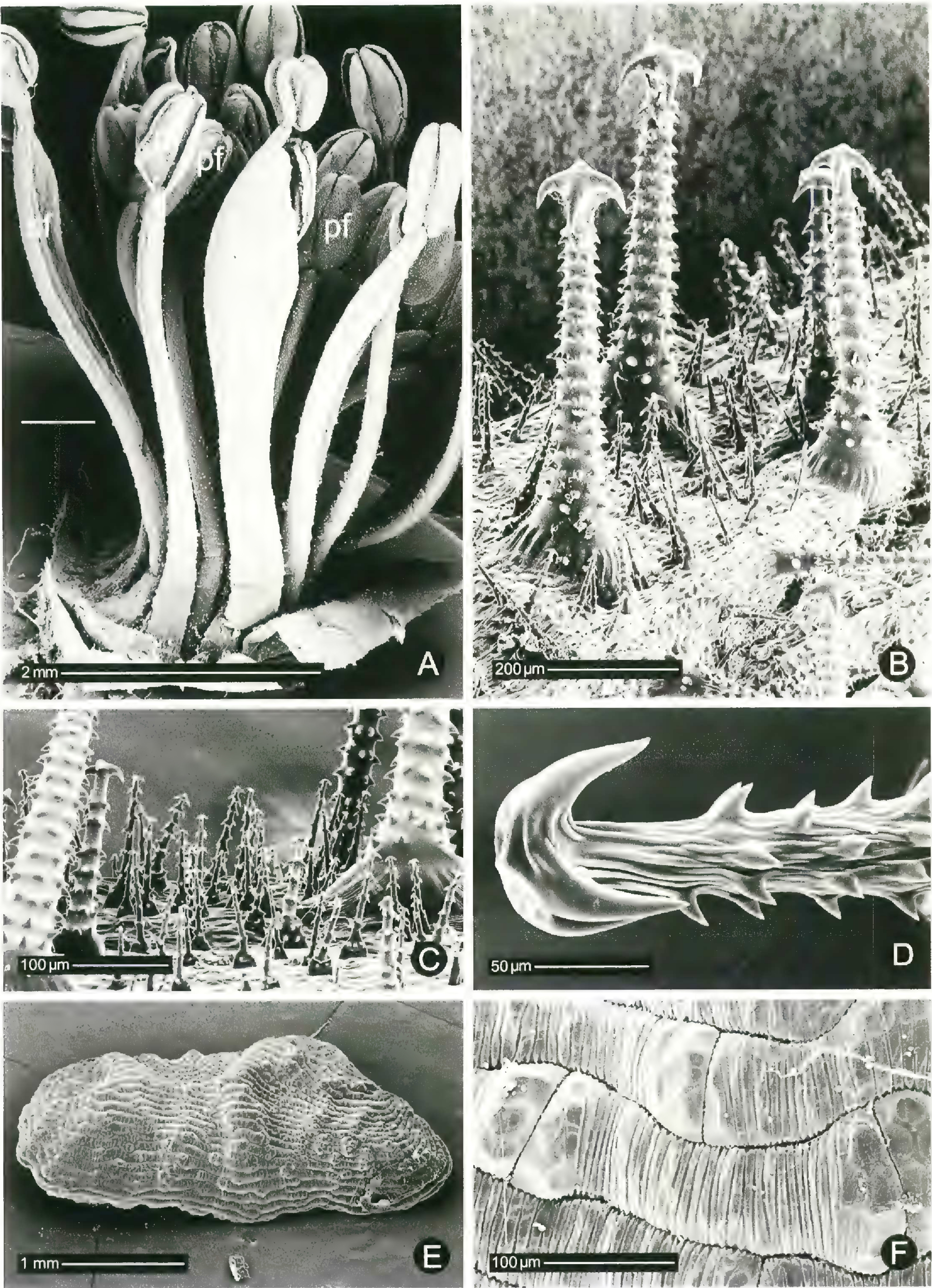


Figure 4. *Mentzelia aspera*. —A. Androecium of anthetic flower of *M. aspera*, showing slightly longer and widened antesealous filaments (sf) and the shorter, antepetalous, filiform filaments (pf; Weigend *et al.* 5733). B–D. Indumentum on ovary (Weigend *et al.* 5733). —B. Mixed indumentum with short and long glochidiate trichomes. —C. Short glochidiate trichomes between bases of long glochidiate trichomes. —D. Apex of long, glochidiate trichome. E, F. Seeds (Rodríguez & Campos 1849). —E. Overview. —F. Detail of testa epidermis.

Carijana, *Gutle & Birger Herzog* 595 (LPB, LP, MO). **Nor Yungas:** Millugnaya, *Buchtien* 4357 (NY); Canamina, *Troll* 1640 (B, M). **Santa Cruz:** Cordillera, turnoff 3 km N of bridge over Río Seco, *Nee* 49060 (BSB, NY), *Nee & Bohs* 49448 (BSB, NY); Nuflo de Chávez, Estancia San Miguelito, 200 km NE of Santa Cruz city, *Fuentes* 1519 (MO). **Sud Yungas:** Chulumani, 25 km toward Asunta, *Beck* 12051 (M, UMSA). **BRAZIL.** **Bahia:** Bahía, Serra do Ramalho, 10 km S of town, *Jardim et al.* 3456 (NY); Mpio de Bom Jesus da Lapa, 16 km on rd. to Ibotirana, *Carvalho et al.* 3948 (CEPEC, M); 3–4 km N of Mpio de Livramento de Nossa Senhora on rd. to Río de Contas, *Jardim et al.* 2033 (BSB, CEPEC, M, NY); Canabrava, Mun. Oliveira dos Brejinhos, *Hatschbach et al.* 67778 (MBM); Serra do Brejo Grande, Serra Geral, Mun. Boquira, *Hatschbach et al.* 67606 (MBM); Bom Jesus da Lapa, near Bahia, *Hatschbach et al.* 55192 (MBM); 10 km N de Guanambi, *Hatschbach et al.* 61904 (MBM). **Ceará:** Grangeiro, Taboleiras, *von Luetzelburg* 24493 (M); La Muralha, *von Luetzelburg* 26474 (M). **Mato Grosso de Sul:** Estr. do Gaturama, Mpio. Corumbá, *Hatschbach* 29495 (MBM). **Minas Gerais:** 15 km N of Montâlvania, *W. R. Anderson et al.* 37180 (WIS); Serra do Espinhaço, Mun. Monte Azul, *Hatschbach et al.* 61897 (MBM). **Paraíba:** Paraíba, *de Moraes* 2113 (B, MO). **CAPE VERDE ISLANDS.** **Santo Antão:** N coast, 1 km E of Cruzinha and Lacacão, *Kilian & Leyens* 2902 (B). **San Vicente:** Monte Verde, *Kilian* 750 (B), *Royl* 844 (B). **COLOMBIA.** **Antioquia:** 2 km N of Antioquia, *Gutiérrez & Barkley* 75C089 (COL); Mpio de Antioquia, rd. Santa Fé to Antioquia–Anzá, *Zarucchi et al.* 5493 (MO). **Atlántico:** Cerca de la playa Miramar, *Dugand* 4412 (COL); Usiacuri, *Barkley* 19043 (COL). **Cauca:** Mercaderes, Mojarras, Granja de la Universidad de Nariño, *de Benavides* 10605 (PSO). **Cundinamarca:** Cordillera Oriental, W slope, near Puente San Antonio de Tena, *Cuatrecasas* 8264 (COL). **Magdalena:** Río Azucarbuena, El Callao, Hac. Santa Marta, *Cuatrecasas & Romero-Castañeda* 24932 (COL); Fonseca, *Haught* 4395 (COL); Cerro San Fernando, *Schnetter & Schnetter* 134 (COL); Gaira, Mpio de Santa Marta, *Romero-Castañeda* 10471 (MO); Parque Tairona, Canaveral, trail to Arrecifes, *Plowman & Davis* 3715 (COL); Santa Marta, *Smith* 477 (BR, MO); rd. La Gran Vía to San Pedro, *Romero-Castañeda* 10640 (MO); Mpio de Fundación, Corregimiento Santa Rosa, *Romero-Castañeda* 11062 (MO). **Nariño:** Chachagüi, puente del Juanambú, carretera Panamericana, *de Benavides* 3631 (PSO); Taminango, Km 68 Panamericana Pasto–Popayán, *de Benavides* 5412 (PSO). **Santander:** En el Cañon de Chicamocha y el Valle de Rupala, *Saravia* 845 (COL). **Sucre:** Trail from Colosó to Reserva de Primatas, *Gentry et al.* 34758 (COL); Mpio Coloso, Bosque Protector of Estación de Primates Finca El Sereno, *Cuadros-V. & Gentry* 4656 (MO). **Valle del Cauca:** Btw. Loboguerrero & Yumbo, *Saravia* 1655 (COL). **Province unknown:** La Picota, *Schwabe s.n.* (B). **ECUADOR.** **Esmeraldas:** Atacames Beach, *Webster* 22801 (MO); Hac. Guayas, 20 km S of Esmeraldas, *Sparre* 15533 (S); 1 km S of city of Esmeraldas, *Hudson* 722 (MO). **Guayas:** Isla de Puna, *N. J. Andersson* 125 (S); Chanduy, *Spruce* 6463 (E); 3 km N of Julio Moreno (Simón Bolívar), *Harling & L. Andersson* 25017 (GB, M); 1 km NW of Chanduy toward Atahualpa, *Holm-Nielsen et al.* 2137 (GB); Guayaquil, *Asplund* 16649 (S); Playas, *Asplund* 5036 (S); Capeira, 22 km on rd. from Guayaquil to Daule, *Gentry & Dodson* 54785 (MO); Capeira, 21 km on rd. from Guayaquil to Daule, *Dodson & Gentry* 12470 (MO); Bosque Protector Cerro Blanco, *Tipaz et al.* 817 (MO); Cerros de Masvale halfway btw. Boliche (Pedro J. Montero) & Jesus María, *Harling & Andersson* 19261 (GB); Guayaquil, golf

club, *Harling & L. Andersson* 8815 (GB); 3 km N of Julio Moreno (Simón Bolívar), *Harling & L. Andersson* 25017 (GB); Guayaquil, railway to Salinas, *Asplund* 7702 (S); 20 km S of Manglaralto, near Palmar, *Holm-Nielsen et al.* 2486 (S); Guayaquil, Universidad de Guayaquil, *Cornejo & Bonifaz* 5648 (GUAY, M). **Islas Galápagos:** Isla Baltra, N part of the island, *Eliasson & Eliasson* 1987 (GB); Santa Cruz, Darwin Research Station, *Bentley* 206 (QCA); Champion Island, *Eisendrath s.n.* (MO); Wreck Bay, *Stewart* 2086 (MO); Indefatigable Island, Academy Bay, *Howell* 9055 (B), *Stewart* 2087 (B); Albemarle Island, Iguana Cove, *Stewart* 2083 (B). **Loja:** San Pedro de la Bendita to El Cisne, Km 8, *Øllgard et al.* 90703 (QCA). **Manabí:** Portoviejo–Jipijapa rd., 1 km S of La Pila, *Harling & L. Andersson* 24827 (GB, M); 5 km N of Jipijapa, *Haught* 3397 (S); Manta, *Asplund* 15945 (S); Puerto Lopez, PN Machalilla, Isla Salango, *Cerón* 18758 (BSB, MO); Isla de la Plata, path to Faro, *Cerón* 18727 (BSB, MO). **Province unknown:** s. loc., *André* 89 (K). **PERU.** **Amazonas:** Bagua, trail from La Peca to El Arenal, *Dostert* 98/79 (CPUN, F, M, USM); Bagua, btw. La Peca & Bagua Chica, *Barbour* 4267 (MO); Bagua, Cumba, btw. Tactago & Chiñuña-Malleta, *Campos et al.* 6108 (MO); Bongará, Jasán, Aserradero, *Vásquez & Rojas* 26486 (MO). **Ancash:** Moro, rd. from Moro to Pamparomas, *Weigend et al.* 8421 (B, HUT, USM). **Apurímac:** Abancay, rd. from Abancay to Andahuaylas, *Weigend & Weigend* 2000/312 (NY, USM). **Cajamarca:** Chota, Llama, 28 km from Llama on rd. to Chiclayo, *Weigend & Dostert* 98/166 (CPUN, F, M, USM); Chota, rd. Olmos to Jaén, Bagua, E slope of Abra Porculla, *Weigend et al.* 8609 (B, HUT, USM); Chota, btw. Chota & Lajas, *Weigend et al.* 7524 (B, HUT, MO, USM); Santa Cruz, Hac. Espinal, ca. 70 km E of Panamericana Norte, *Ferreira* 12392 (USM); Jaén, Jaén to San Ignacio, 45 km from Jaén, *Weigend et al.* 98/459 (CPUN, F, M, USM); 9–16 km E of Pucará on rd. to Bagua, *Gentry et al.* 22729 (USM); Huehuaya to Peña Blanca (Tamborapa–Tabaconas), *Leiva et al.* 1239 (HAO, M); San Ignacio, Distr. Coipa, Tamborapa, left bank of Río Tabaconas, *Campos & Díaz* 3001 (BSB, MO, USM); San Ignacio, Distr. Chirinos, Cenezal, *Campos & Díaz* 2189 (BSB, MO); San Ignacio, Huarango, btw. San Martín & La Mushca, *Campos et al.* 6222 (MO); San Ignacio, Distr. Chirinos, Caserío Las Juntas, banks of Río Tamborapa, *Rodriguez & Campos* 1849 (B, HUT, MO); San Ignacio, Distr. San Ignacio, btw. Puerto La Naranja & Puerto Huaquillo, *Rodriguez & Campos* 1857 (B, HUT, MO). **Cuzco:** Convención, Quillabamba, *Vargas* 7107 (CUZ); Chawares, *Vargas* 20784 (BSB, CUZ); La Convención, Huayopata, San Luis, *Galiano et al.* 4915 (BSB, MO); Convención, Potrero, *Vargas* 2144 (MO). **Junín:** Satipo, rd. from San Ramón to Satipo, 2 km from Santa Ana, *Weigend et al.* 5733 (BSB, HUT, M, USM). **La Libertad:** Trujillo, Santa Rosa near Trujillo, *Sagástegui & Araujo* 7783 (HUT, NY); Laguna San Bartolo, near Ascope, *Müller & Krebs* 12129 (USM); Santa Clara, Valle Chicama, Trujillo, *López s.n.* (HUT 0799); Santa Rosa (alrededores de Trujillo), *Sagástegui & Ramirez* 13063 (HUT); San Antonio, Ascope, *López & Sagástegui s.n.* (HUT 2530); Ascope, Mocan, *Sagástegui* 14905 (MO). **Lambayeque:** Lambayeque, Sapote, Motupe, *Llatas-Quiroz* 3133 (MO); Ferreñafe, old rd. Tumán–Patapo to Batán Grande (destroyed in the 1982 El Niño, now replaced by direct route Ferreñafe–Batán Grande), *Weigend et al.* 8516 (B, HUT, USM); Ferreñafe, rd. from Batán Grande to Incahuasi resp. Ullurpampa (syn. Uyurpampa), *Weigend et al.* 8523 (B, HUT, USM). **Lima:** Huarochiri, Santa Rosa de Chontay, *Cano* 1139 (M, USM). **Piura:** Chulucanas, rd. Huancabamba to Chulucanas, btw. Malacasí & Buenos Aires, *Weigend & Dostert* 98/287 (CPUN, F, M, USM); rd. Chulucanas to Frías, near Papelillo, *Weigend*

& *Dostert* 98/178 (CPUN, F, M, USM); near Huancabamba, *Acleto* 469 (USM); Tablazo River, *Haught* 217 (COL); Chulucanas, Cerro Vicus, 52 km from the rd. to Piura, Morropon, *Sánchez & Guevara* 6196 (CPUN, M). **San Martín:** Granja Bellavista, *Chrostowski* 70 280 (WIS); San Martín, Vaca Pozo, Río Cumbaza, SE of Tarapoto, *Woytkowski* 35487 (USM); along rd. Juanjuí to Tarapoto, 35 km S of Tarapoto, *Croat* 58081 (USM); Tarapoto, *Spruce* 4922 (BR); Fundo San Isidro (Tarapoto), *Sagástegui* 8324 (HUT); Chazuta, Río Huallaga, *Klug* 4030 (MO); San Martín, Tarapoto, Vaca Pozo, *Woytkowski* 35181 (M). **Tumbes:** La Peña 16 km SE of Tumbes, *Ferreyra* 5987 (USM). VENEZUELA. **Aragua:** Lago de Valencia, Isla Bruja, *Vareschi & Gessner* 1937 (M); btw. Maracay & Mariana, *Alston* 5688 (WIS). **Carabobo:** Saman Mocho, experimental fields of the Facultad de Agronomía de al UCV, *van Rooden & Akkermans* 131 (WIS). **Distrito Federal:** Llanos near Chaguaramas, *Schwabe s.n.* (B); Cordillera de la Costa, old rd. from Caracas to La Guaira, *Oberwinkler* 14528 (M); Libertador, valley of Río Chichiriviche, 0.5 km S of Chichiriviche, *Steyermark & Carreño* 112726 (MO, NY); near Colonia Tovar, *Fendler* 453 (MO). **Lara:** Quebrada La Mata, 1 km N of Cabadure, 80 km SE of Barquisimient, *Mejier & Durand* 1 (MO, NY). **Maracay:** s. loc., *Vogel* 1273 a/b (M). **Mérida:** Ejido, *Weigend* 3613 (M); Mérida, *Schwabe s.n.* (B). **Miranda:** Parque Nacional El Ávila, NNE of Caucagüita, *Steyermark et al.* 113993 (MO). **Zulia:** Miranda, btw. El Mecocal & El Consejo, 16 km SE of El Mecocal, *Bunting* 5997 (NY); along rd. (km 13, bridge over lake) to Los Crespos, *Bunting et al.* 11818 (NY); Bolívar, rd. Lara–Zulia to El Zamoro, on roadside, *Bunting* 8294 (NY).

4. *Mentzelia bartonioides* (C. Presl) Urb. & Gilg in Engl. & Prantl, Nat. Pflanzenfam. 3(6a): 110. 1894. Basionym: *Acrolasia bartonioides* C. Presl, Reliq. Haenk. 2: 39. 1835. TYPE: Tab. 55, in C. Presl, 1835. Figure 5.

Mentzelia andina Urb. & Gilg, Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 76(1): 31. 1900, synonymized under *M. pinnatifida* by Urban & Gilg 1900: 356. TYPE: Chile. [IV Región, de Coquimbo:] Coquimbo, Cordillera de las Patas, *C. Gay* 662 (lectotype, designated here, P!).

Mentzelia haenkii A. Gray, Pl. Wright. 1: 74. 1852, nom. inval., in nota.

Mentzelia pinnatifida (Phil.) Urb. & Gilg, Nova Acad. Acta Caes. Leop. Carol. German. Nat. Cur. 76(1): 356. 1900. Syn. nov. Basionym: *Acrolasia pinnatifida* Phil., Anales Univ. Chile 85: 6. 1893 [1894]. TYPE: Chile. [III Región, de Atacama:] Atacama, Quebrada del Molle, Bandurrias, *W. Geisse s.n.* (holotype, SGO not seen).

Mentzelia pinnatifida (Phil.) Urb. & Gilg var. *uniseriata* Hauman, Anales Soc. Ci. Argent. 86: 290. 1918. TYPE: Argentina, Mendoza: valley of Río Plumo, 2900 m, *L. L. Haumann* 231 (lectotype, designated by Sleumer, 1955: 416, BA 17131 not seen; isotypes, BR!, G not seen).

Mentzelia solierii (Gay) Urb. & Gilg in Engl. & Prantl, Nat. Pflanzenfam. 3(6a): 110. 1894. Basionym: *Acrolasia solierii* Gay, Fl. Chil. 2: 430. 1846. TYPE: Chile. [III Región, de Atacama:] Copiapó, on dry hills near Copiapó, 1839, *C. Gay s.n.* (type, P!).

Annual herb 0.05–0.3 m tall, stiffly erect; stems basally 1–5 mm thick, shoot unbranched (in small individuals) to widely branched, with a single, little-branched taproot; stem off-white, densely covered with thin glochidiate trichomes. Leaves subsessile with long-tapering base, basal leaves few (in small individuals) or numerous in dense, short-lived rosette, upper ones alternate; lamina narrowly obovate, 25–100 × 5–20 mm, sinuate-dentate to pinnatifid with lobules widely spaced; base long-tapering; apex rounded to acuminate. Inflorescence bracteose, few- to many-flowered, strongly basitonic, initially dense, later lax (branching angle between paraclades of dichasia < 90°); proximal internodes 1–3× as long as subtending bracts, distal internodes much shorter than subtending bracts; bracts ovate, 5–25 × 3–15 mm; flowers subsessile to sessile. Flowers with calyx tube conical, 5 × 3 mm, densely covered with erect, thin, glochidiate trichomes 0.1–0.6 mm long; calyx lobes 1–2 × 1–1.5 mm, ovate-acuminate; petals widely ovate, 2.5–5 × 2–4 mm, apex acuminate to apiculate, pale to golden yellow; stamens 10 to 30, filaments 1.5–2.5 mm, filaments of antesealous stamens sometimes with distinctly widened base, anthers ca. 0.5 × 0.3 mm; style filiform, 1.5–2 mm, with 3 decurrent stigmas. Capsule sessile, cylindrical, 5–10 × 3–5 mm, opening with 3 apical valves; seeds 15 to 25, ca. 1.5 × 1.5 mm, very irregularly angular, greyish brown.

The protologue of *Mentzelia andina* cites both *Gay* 662 (B, P) and *Philippi s.n.* (B) as types, and lectotypification is therefore required. Because the Berlin specimens are lost (B† photo at F 10132), the *Gay* collection is selected here as the only extant type specimen. Another synonym of *M. bartonioides* is *M. citrina* Urb. & Gilg, which was synonymized by Sleumer (1955).

There has been a trend toward recognizing fewer and fewer species in this group since the recognition of four distinct taxa by Urban and Gilg (1900). In the most recent studies (Sleumer, 1955; Pérez-Moreau & Crespo, 1988), only two taxa (*Mentzelia pinnatifida* and *M. bartonioides*) were recognized, supposedly differing in the density of the trichome cover of the stem base and the expansion of the inflorescence branches, both of which are ontogenetically variable. This is illustrated by a set of collections from one locality at varying elevations in Coquimbo (*Squeo* 88152, 88105, 88005, 88024), which span the entire range of characters given for the original four species with regard to fruit size, indument, and inflorescence structure. Neither Sleumer (1955) nor Darlington (1934) were able to clearly separate the taxa morphologically or geographically, and my own observations also fail to reveal any differentiation;

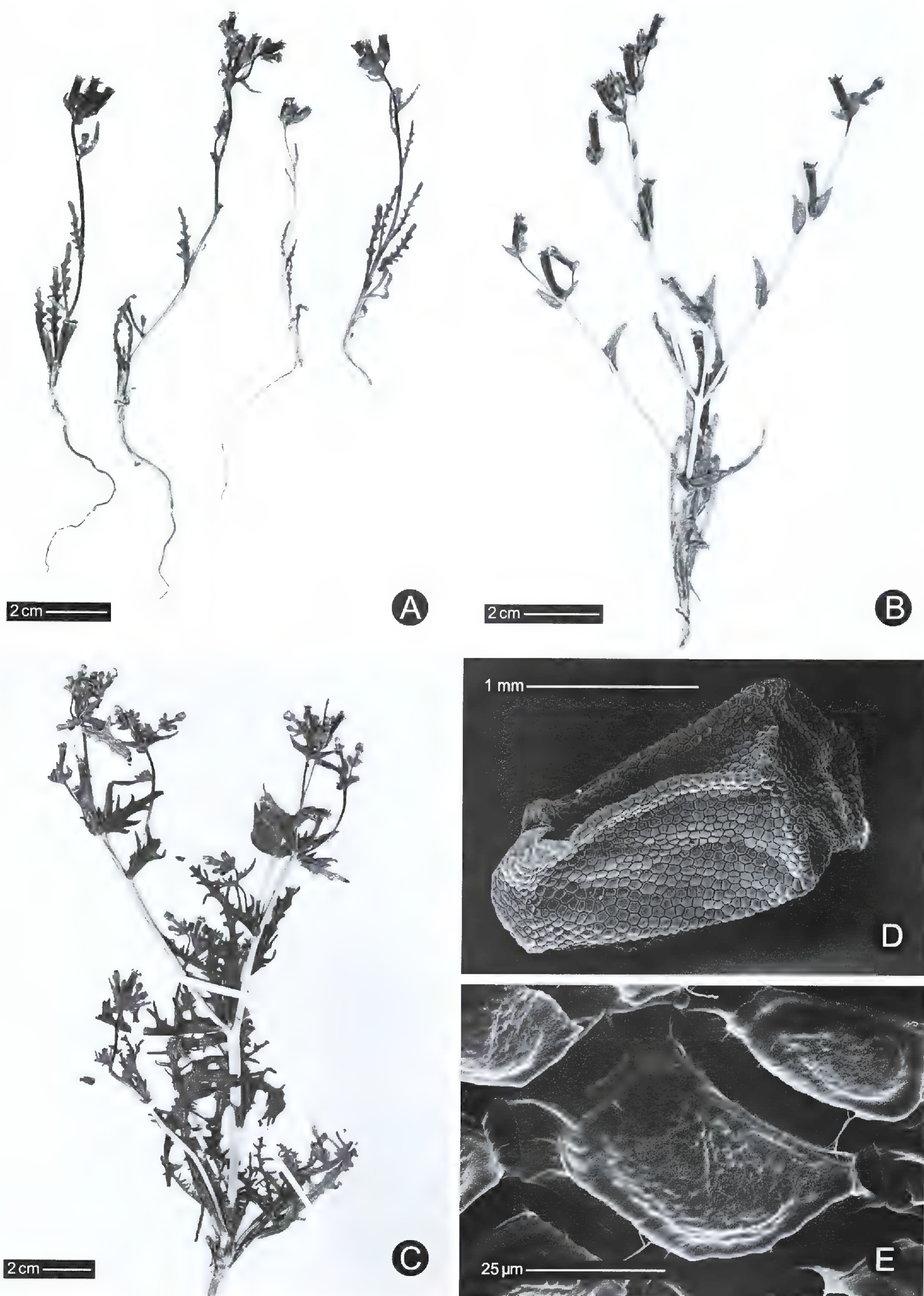


Figure 5. *Mentzelia bartonioides*. A–C. Habit. —A. Small, sparsely ramified plants (*Squeo* 88005). —B. Moderately ramified specimens (*Muñoz* 2746). —C. Well-developed individual (*Wagenknecht* 18585). D, E. Seeds (*Kiesling* 8082). —D. Highly irregularly shaped, sharply angled seeds. —E. Detail of testa epidermis.

thus, all South American taxa are reduced to a single name here.

Distribution and habitat. The species occurs in semi-desert vegetation and is a short-lived annual found at elevations of (1000–)2000–3500 m. The species is also reported from Mendoza, Argentina (Sleumer, 1955).

Additional specimens examined. ARGENTINA. **San Juan:** Calingasta, rd. from Río Blanco to Pachón, Las Juntas, *Ruthsatz* 2650 (Hb. Ruthsatz–Universität Trier, Fachbereich VI Geobotanik), *Kiesl* 88901 (Hb. Ruthsatz–Universität Trier, Fachbereich VI Geobotanik); campground, *Ruthsatz* 8870 (Hb. Ruthsatz–Universität Trier, Fachbereich VI Geobotanik, M); Calingasta, Río Blanco (rd. to El Pachón), *Kiesling* 8082 (MO, SI); Cordillera de Espinazito, Las Manantiales, *Stelzner* in *Kurtz* 9755 (B photo at F 10135). CHILE. **III Región, de Atacama:** 11 km S of Inca de Oro, *Muñoz et al.* 2746 (MO, SGO). **IV Región, de Coquimbo:** Quebrada El Pangue N of Chachiguaz, *Rosas* 1478 (M); Cordillera de Doña Ana, *Squeo* 88152 (MO, ULS), *Squeo* 88105 (MO, ULS), *Squeo* 88005 (MO, ULS), *Squeo* 88024 (MO, ULS); Elqui, Los Lechuzos, 19 km E of Rivadavia, rd. to Laguna Dam, *Wagenknecht* 18585 (MO, UC).

5. *Mentzelia heterosepala* Weigend & E. Rodr., *Arnaldia* 5: 52, figs. 1, 2. 1998. TYPE: Peru. Amazonas: Bagua, rd. from Bagua Chica to Imauta, El Muyo, 1100 m, *E. Rodríguez R.* 1298a (holotype, M!; isotypes, F!, HUT!, USM!). Figure 6.

Shrub 1.5–2 m tall; stems up to 5 cm thick basally, ligneous, bark dark grey, exfoliating late or not at all, if exfoliating then in narrow, dark brown strips, without lenticels, young shoots very densely covered with very short glochidiate trichomes (< 0.5 mm long) and scabrid trichomes (ca. 0.5 mm long). Petioles 5–10 mm; lamina narrowly ovate, 50–80 × 20–25 mm, margin subentire to shallowly and remotely serrate; base cuneate; apex acuminate. Inflorescences frondose, often few-flowered, if many-flowered then with short paraclades barely overtopping the primary flower; bracts 15–25 × 5–8 mm, pedicels ca. 1 mm. Flowers with conical calyx tube ca. 10 × 3–4 mm, densely covered with very short glochidiate and scabrid trichomes, outer calyx lobes 18–20 × 8–10 mm, inner calyx lobes 16–18 × 5 mm; petals widely ovate, ca. 35 × 20 mm, base narrowed, apex acuminate; stamens 90 to 110, the 15 to 20 outer filaments ca. 25 mm long and erect from a spreading base, inner stamens 15 mm long, anthers ca. 1 × 0.75 mm; style filiform, ca. 30 mm, with 3 decurrent stigmas. Capsule clavate, ca. 10 × 4 mm, covered very densely with erect glochidiate and slightly acroscopic scabrid trichomes 100–200 µm long, scabrid trichomes longer than glochidiate trichomes, with a smooth apex, glochidiate trichomes with distinct 4- to 5-hooked apex

and 3 to 4 bands of hooks; seeds 1 to 3, ca. 3.5 × 1.5–2 mm, greyish brown.

Mentzelia heterosepala is the only species of this genus in South America with clearly delimited, subcorymbose inflorescences and subentire leaves (Fig. 6A); it also has the most pronounced shrubby habit and the thickest branches of any seen South American *Mentzelia* species. With these characters, *M. heterosepala* resembles tree-like *M. arborescens* Urb. & Gilg from southern Mexico more than its South American congeners.

Distribution and habitat. *Mentzelia heterosepala* was recently collected (1996) for the first time in a single locality on the Río Marañón in Peru, but has now been reported from the Marañón Valley in four different departments and appears to be both widespread and locally abundant (in places dominating the vegetation of scree slopes). It is found at elevations of 900–1600 m, is restricted to steep scree slopes and rock slides, and is found very rarely on rocky outcrops.

Additional specimens examined. PERU. **Amazonas:** Chachapoyás, rd. Balsas to Leimebamba, *Weigend et al.* 97/390 (F, M, USM); rd. Celendín to Chachapoyás, 8–10 km from Puente Chocanto, *Smith & Cabanillas* 7053 (USM); rd. Balsas to Bolívar, before Longotea, *Weigend et al.* 2000/804 (BSB, F, HUT, M, USM). **Ancash:** Pallasca, San José, near Conchucos, *Cano et al.* 15444 (BSB, USM); Sihuas, rd. Sihuas to Huancaspata, *Sagástegui et al.* 17426 (BSB, HAO, HUT); ascending the Río Rupac valley to Sihuas from Río Marañón, *Weigend & Schwarzer* 8027 (BSB, HUT, USM), *Cano et al.* 15846 (BSB, USM). **Cajamarca:** Celendín, rd. Celendín to Balsas, *Weigend et al.* 97/388 (F, M, USM). **La Libertad:** Pataz, 5 km on rd. Chagual to Chugay (Huamachuco), W of Río Marañón, *Weigend & Schwarzer* 7927 (BSB, HUT, USM); ca. 4 km on rd. Chagual to Tayabamba, E of Río Marañón, *Weigend & Schwarzer* 7923 (BSB, HUT, USM); Piás, Quebrada El Oso, *Alayo* 83 (HAO); btw. Chagual & Pataz, *Sagástegui et al.* 17244 (BSB, HAO, HUT); btw. Chagual & Pataz, *Sagástegui et al.* 17244 (BSB, HAO, HUT); Chagual, above Río Marañón, *Rodríguez* 2543A (HUT); Bolívar, btw. Pusac & Huanabamba, *Mostacero et al.* 3608 (HUT).

6. *Mentzelia parvifolia* Urb. & Gilg ex Kurtz, *Revista Mus. La Plata, Secc. Bot.* 5: 289. 1893. TYPE: Argentina. Córdoba: Córdoba, Capital, *F. Kurtz* 614 (lectotype, designated here, CORD not seen). Figures 7, 8.

Mentzelia parvifolia Urb. & Gilg ex Kurtz var. *transiens* Sleumer, *Bot. Jahrb. Syst.* 76: 422. 1955. Syn. nov. TYPE: Argentina. Catamarca: Santa María, margin of Campo Arenal near Punta de Balastro, 2400 m, 3 Feb.–Mar. 1952, *H. O. Sleumer* 2663 (holotype, LIL not seen; isotypes, S not seen, US [2]!, W!).

Acrolasia elata Phil., *Anales Univ. Chile* 85: 5. 1893 [1894]. TYPE: Argentina. Mendoza: rd. to Mendoza, *Goldsack s.n.* (holotype, SGO not seen).

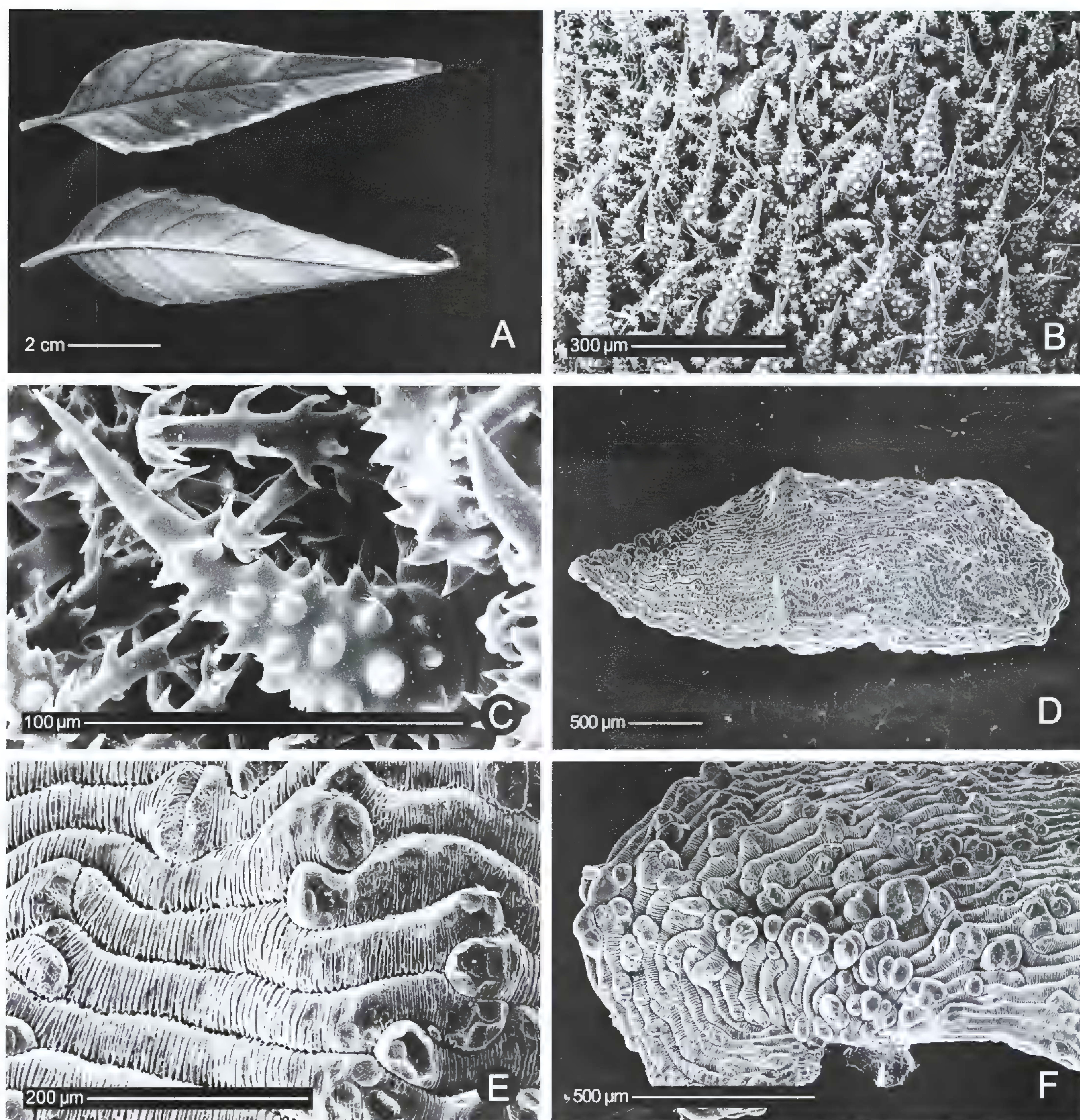


Figure 6. *Mentzelia heterosepala*. —A. Mature foliage leaves (Weigend & Schwarzer 8027, cultivated in Berlin). B, C. Indumentum on ovary. —B. Overview, note the very dense cover with short scabrid trichomes. —C. Details, scabrid trichome. D–F. Seeds (Weigend & Schwarzer 8027). —D. Overview, note the undulated epidermis surface. —E. Detail of testa epidermis, note the transverse striations and thickened poles of outer periclinal wall. —F. Hilar pole of seed and hilum.

Mentzelia grisebachii Urb. & Gilg, Nov. Actorum Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 48. 1900. TYPE: Argentina. Catamarca: Río de los Nacimientos, *F. Schickendantz 104* (lectotype, designated here, GOET!).

Mentzelia jujuyensis Sleumer, Bot. Jahrb. Syst. 76(4): 420. 1955. Syn. nov. TYPE: Argentina. Jujuy: Tilcara, Quebrada de Huasamayo, 2600 m, *E. Petersen & J. P. Hjerting 26* (holotype, LIL not seen; isotype, W!).

Annual herb, 0.1–0.5 m tall, divaricately branching; stems basally to 5 mm thick, bark exfoliating on older branches, young shoots densely covered with

glochidiate trichomes 0.1–0.15 mm long; roots (in Peruvian populations) conspicuously thickened and succulent, up to 150 × 10–15 mm. Leaves opposite below, alternate above; lower petioles up to 15 mm, upper leaves sessile; lamina ovate, 30–90 × 20–40 mm, lobulate, deeply lobed to pinnatifid or only deeply and irregularly serrate; base cuneate; apex acuminate. Inflorescences as terminal dichasia or thyrsoids, divaricate (branching angle between paracletes of dichasia 160°–180°); bracts strongly recaulescent on branches (10 mm or to next flower), bracts 15–30 × 5–15 mm. Flowers sessile, with

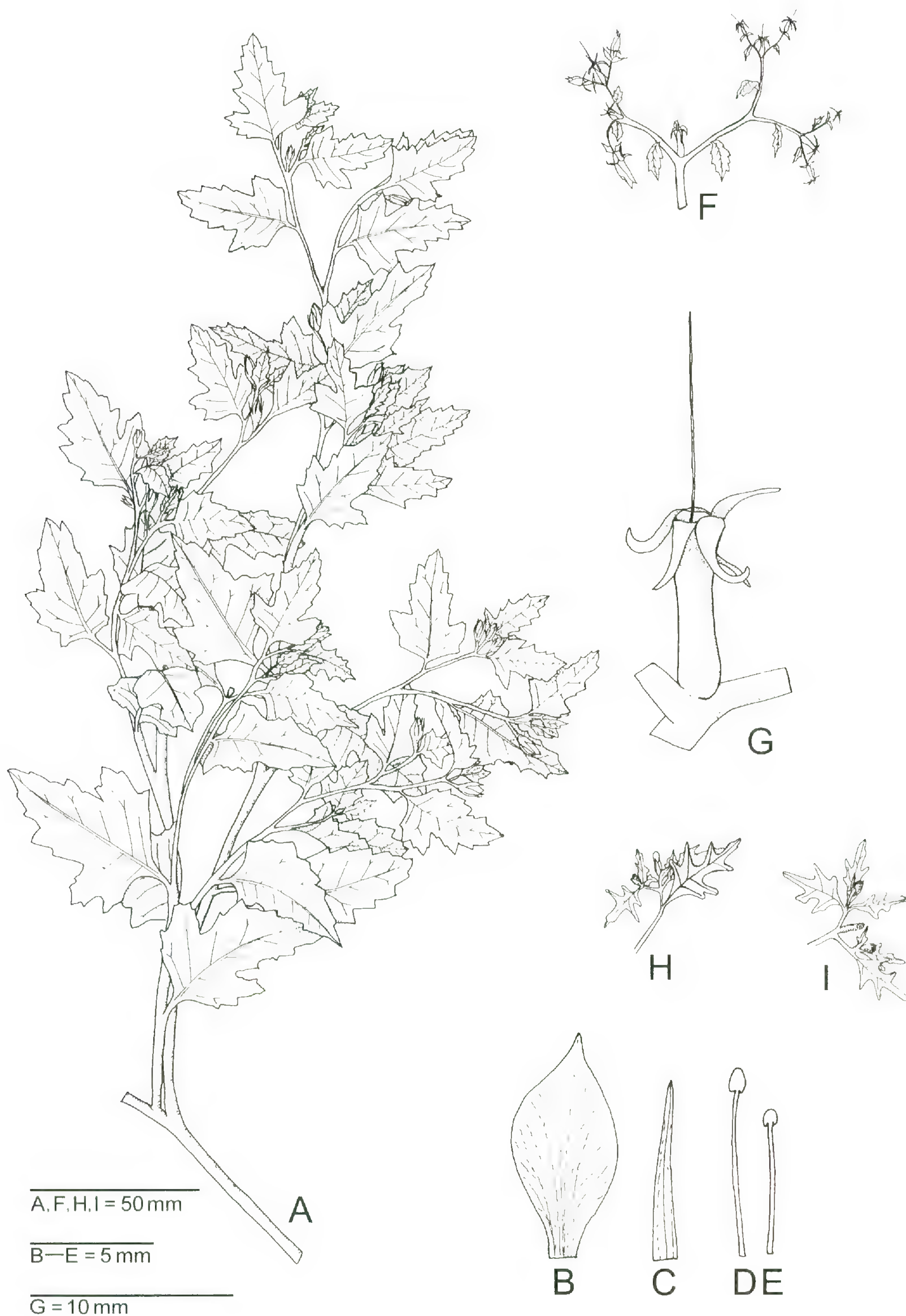


Figure 7. *Mentzelia parvifolia*. —A. Entire shoot with inflorescences. —B. Petal. —C. Calyx lobe. —D. Outer stamen. —E. Inner stamen (Coro 63). —F. Inflorescence. —G. Fruit (Beck 26563). —H, I. Inflorescence branches (Spooner 6585).

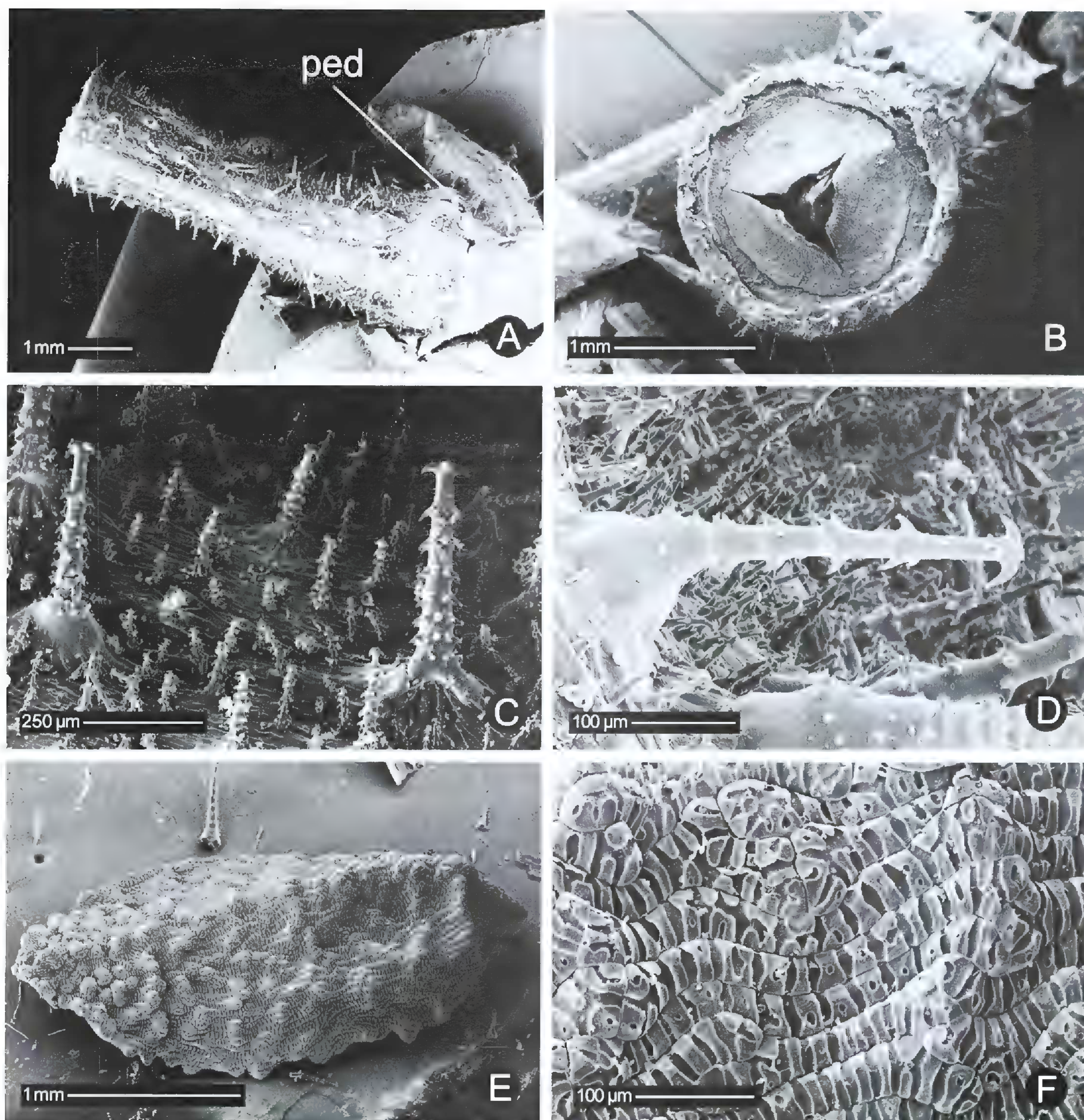


Figure 8. *Mentzelia parvifolia*. A, B. Fruit (Weigend *et al.* 8337). —A. Fruit, lateral view, note indistinct, thickened pedicel (ped). —B. Apex of mature capsule with barely opened apical valves. C, D. Indumentum on ovary (Coro 63). —C. Overview, mixture of long and short glochidiate trichomes. —D. Close-up of long glochidiate trichome. E, F. Seed (Weigend *et al.* 8337). —E. Overview, note irregularly angular shape and undulate epidermis. —F. Detail of testa, note transverse grooves and thickened end of testa cells.

cylindrical calyx tube, $4-5 \times 1-2$ mm, with dense cover of glochidiate hairs $50-500$ μm long; calyx lobes long-acuminate from narrowly oblong base, $4-7 \times 1-2$ mm; petals obovate, $10-15 \times 5$ mm, base narrowed, apex apiculate, pale yellow. Stamens 35 to 45, ca. 10 mm, anthers ovate to oblong, ca. 0.5×0.3 mm, pale yellow; style filiform, ca. 10 mm, with 3 decurrent stigmas. Capsule sessile or shortly pedicellate, erect or more often deflexed, $10-14 \times 1.5$ mm, covered with glochidiate trichomes only, longer ones ca. $300-450 \times 60$ μm , with 5 to 7 bands of hooks,

shorter ones $60-200$ μm , with 3 to 5 bands of hooks; seeds 3 to 6, $2.5-3.5 \times 1.5$ mm, greyish brown.

In the protologue of *Mentzelia parviflora*, the additional specimens *F. Kurtz* 614 (B, CORD) and *F. Kurtz* 2724 (B) are cited. *F. Kurtz* 614 (B) was selected as lectotype by Sleumer (1955), although only the photograph of the Berlin specimen (B† photo at F 010131) is extant. A new lectotypification is therefore required, and I propose choosing the CORD specimen, since *F. Kurtz* 2724 (B) is also lost. The

protologue for *M. grisebachii* (Urban & Gilg, 1900) also cites the specimens *F. Schickendantz 11* (B), *F. Schickendantz 250* (B, B photo at F 10126), *O. Kuntze s.n.* (B), *G. Hieronymus & P. G. Lorentz 326* (G, K, NY), and *C. Spegazzini 104351a* (B). Lectotypification is therefore required. The Berlin material was destroyed by fire in 1943 (Hiepko, 1987) and *G. Hieronymus & P. G. Lorentz 326* is a mixed collection with *M. aspera*; this leaves *F. Schickendantz 104* (GOET) as the only extant and unequivocal collection, and it is therefore used here to lectotypify the species.

The fruits of *Mentzelia parvifolia* (Fig. 13A, B) are slightly variable in shape, and separate taxa have been established for the forms with shortly pedicellate instead of sessile capsules (*M. grisebachii*, *M. parvifolia* var. *transiens*, *M. jujuyensis*; Urban & Gilg, 1900; Sleumer, 1955). However, sessile and pedicellate fruits are frequently found on the same plant, and even the type specimen of *M. parvifolia* var. *transiens* (Sleumer 2663, W) has both sessile and pedicellate fruits, so that this character may be disregarded. From my own observations, these characters are continuously distributed and I was unable to recognize discrete taxa.

Two specimens from Bolivia (Cochabamba, *Pedrotti et al. 31*, and Chuquisaca, *Smith et al. 396*) apparently lack the typical divaricate branching pattern and also have unusually long, closely serrate leaf margins and are thus fairly aberrant for the species. More material and mature fruits will be required to ascertain whether these specimens represent a distinct taxon.

Distribution and habitat. *Mentzelia parvifolia* is reported here for the first time from Peru, where it is locally very abundant in a semi-desert area between Omate and Moquegua. It apparently only germinates in unusually moist years and was abundant in April 2006 in places where a single plant could not be found in April 2004. In Peru, where the plant was studied in the field, the plant occurred in mixed stands with, e.g., *Cistanthe celosioides* (Phillipi) Carolin ex Hershk. and *Malesherbia arequipensis* Ricardi.

The species is now known from Peru, Bolivia, and Argentina and has been collected at elevations of (900–)1500–2500(–3500) m. In addition to the provinces recorded below, the species as defined here is also reported from Argentina from the provinces of Jujuy, La Pampa, San Luis, Santiago del Estero, Santa Fé, and Tucumán (Sleumer, 1955).

Additional specimens examined. ARGENTINA. **Catamarca:** Belén, Quebrada de Belén, *Cabrera et al. 16756* (M); Belén, Quebrada de Belén, *Sleumer & Vervoorst 2359* (BR, W); Belén, btw. Pozo de Piedra & Yacutula, Las Faldas, *Sleumer & Vervoorst 2637* (W); Tinogasta, Chaschuil valley,

69 km on Rte. 45 from Fiambalá to Paso San Francisco, *Leuenberger et al. 4239* (B, CORD, Z); Quebrada de Polén to Puerta de San José, *Sleumer & Vervoorst 2360* (W); btw. Granadillas & Pozo de Piedra, *Sleumer & Vervoorst 2385* (W); Lampasito, *Reales 1981* (W); Punta Balestro, *O'Donnell-Meyer 5175* (W); El Desmonte, Punta Balestro to Santa Maria, *O'Donnell-Meyer s.n.* (W); Tinogasta, near El Algarrobal, *Vervoorst 3148* (W); Province Andalgalá, Cuesta de Chilca, *Hunziker & Gamero 12434* (MO); Dpto. Andalgalá, La Playa, *Jørgensen 916* (MO). **Córdoba:** Dpto. Pumilla, Calera, *Stuckert 12440* (G); s. loc., Dec. 1891, *Kuntze s.n.* (NY); Tulumba, rd. 16, 27 km W of Dean Funes, *Krapovickas & Cristóbal 46594* (MO). **La Rioja:** Capital, Ruta Provincial 10, Km 891, Sierra de Mazan, *Hunziker & Gamero 12488* (MO); Chilecito, *Dawson 3428* (HUT); Famatina, RN 40, *Botta & Miconi 598* (MO). **Mendoza:** Las Heras, Challao, *Paci & Barkley 19Ar902* (W). **Salta:** Guachipas, Arroyo Alemania, N of railroad bridge, *Novarra 8443* (Z); Cafayate, Yacuchuya, *Castellanos 46850* (W); Campos de Cachi, *Castellanos 46857* (W); Gólgota, *West 6181* (MO); Santa Victoria, Santa Victoria, *Meyer 5260* (W); Rosario de Lerma, Santa Rosa de Tastil, rte. 51, Pucará, *Nicora et al. 8985* (MO). **San Juan:** Jachal, Cuesta del Huaco, *Palacios et al. 1706* (BR, W); Ullún, path to Quebrada de la Dehesa, *R. Kiesling et al. 5949* (MO); Quebrada de Talacasto, *Cabrera 30166* (MO). BOLIVIA. **Chuquisaca:** Sud Cinti, Tajsara mtns., *Gerold 33* (LPB, M). **Cochabamba:** Capinota, near Capinota, *Pedrotti et al. 31* (LPB). **Potosí:** Nor Chichas, 5 km N of Orheolu, *Torrico & Peca 496* (LPB, M, MSB). **Tarija:** Cercado, btw. Tarija & Tanibut, *Bastián 685* (LPB, M); Santa Ana, *Coro 1248* (LPB, M); Cercado, path to Yesera, 6 km, *Ehrich 469* (LPB, M); Cercado, 10.2 km N of toll station 6 km E of Tarija, rd. to Entre Ríos, *Spooner & García 6585* (LPB, TAES, WIS); Méndez, *Coro 63* (LPB). **Province unknown:** Bolivian plateau, *Bang 1005* (E, G, M, W), *Bang 748* (W). PERU. **Moquegua:** Mariscal Nieto, rd. Omate to Moquegua, 2 km after bridge over Río Tambo, *Weigend et al. 8349* (B, HUSA, USM); Mariscal Nieto, rd. Omate to Moquegua, 4 km after bridge over Río Tambo, *Weigend et al. 8361* (B, HUSA, USM); General Sánchez Cerro, btw. Omate & Moquegua, directly beneath Omate, Urinay, *Weigend et al. 8337* (B, HUSA, USM).

7. *Mentzelia scabra* Kunth in HBK, Nov. Gen. Sp. 6: 120. 1823. TYPE: [Colombia. Nariño:] btw. Pasto & Tuquerres, *A. Humboldt & A. Bonpland 2173* (lectotype, designated by Weigend, 2001: 25, P-BONPL!; isotype, P!).

Strongly branched subshrub or shrub, 2 m tall, erect, more rarely decumbent or ascending or climbing; stems basally 5–20 mm thick, lignescent or ligneous, very brittle, with white to beige exfoliating bark or persistent, dark brown to black bark with conspicuous lenticels; young shoots very densely set with glochidiate and scabrid trichomes. Leaves opposite on seedlings, then spirally inserted, sub-opposite or opposite in the inflorescence; petioles 2–15 mm; lamina ovate, 20–150 × 35–70 mm, lobed or undivided, usually with 1 distinctive leaf lobe proximally on each side, margin irregularly serrate to lobulate; base shallowly cordate, truncate to

cuneate; apex always acuminate. Inflorescences as terminal, frondose thyrsoids, widely branched (branching angle between paraclades of dichasia $< 90^\circ$); bracts $10\text{--}60 \times 10\text{--}35$ mm; pedicels 1–5 mm. Flowers with calyx tube conical to ovoidal, ca. 5×3 mm, densely covered with glochidiate and scabrid trichomes 0.1–2.5 mm long; calyx lobes acuminate from ovate base, $7\text{--}15 \times 1\text{--}3$ mm; petals widely obovate, apex apiculate, $12\text{--}30 \times 6\text{--}16$ mm, slightly pilose apically on back, golden yellow to pale yellow; stamens 60 to 120, ca. 10 outer ones usually ca. $1.5\text{--}2\times$ as long as inner ones and erect from a spreading base, the inner ones shorter and negatively geotropic; anthers ca. 1×0.75 mm, pale yellow, style filiform with 3 decurrent stigmas. Capsule obovoid to clavate, with pedicel (0–)4–10 mm, opening with 3 apical valves, $8\text{--}14 \times 5\text{--}7$ mm, covered with a mixed indument of (at least basally) erect to slightly acroscopic scabrid and glochidiate trichomes, scabrid trichomes ca. $3\text{--}4\times$ longer than glochidiate trichomes; seeds 1 to 5, brown, irregularly oblong, ca. 4.5×1.8 mm, grey.

Mentzelia scabra is redefined here as a widespread and rather heterogeneous species including the majority of species previously recognized from *Mentzelia* sect. *Mentzelia* in South America (*M. soratensis* Urb. & Gilg, *M. fendleriana* Urb. & Gilg, *M. chilensis* Gray, *M. cordobensis* Urb. & Gilg, and *M. grandiflora* Ruiz & Pav. ex G. Don). Although there is no particularly clear dividing line between *M. scabra* from South America and *M. hispida* in northern Central America, fruit size, pedicel length, and the differences in trichome complement indicate that they are distinct entities. The otherwise very similar Mexican/North American *M. hispida* has capsules $2.5\text{--}5\times$ as long as wide (vs. $1.5\text{--}2\times$ as long as wide) and often very long-pedicellate (up to 15 mm, W. Boege 184 & 1445, *M. Rosas* R. 61 [all FR]). Four of

the species described for South America can be assigned subspecies rank on the basis of relatively weak but constant characters (habit, flower size, bract size, and indument on the ovary) and are here recognized as *M. scabra* subsp. *chilensis*, subsp. *grandiflora*, subsp. *scabra*, and subsp. *cordobensis*. All of these subspecies are relatively narrowly endemic, apart from subspecies *chilensis* (see that section for discussion), which covers nearly the entire distributional range of the species. *Mentzelia cordobensis* from Argentina is only marginally different from typical *M. scabra* from southern Colombia and differs in minor details of the length and composition of the indument and in leaf division and plant habit. It is reduced here to subspecies rank, since there are some, albeit weak, differentiating characters and more or less exclusive distribution areas. Also, *M. chilensis* var. *atacamensis* Urb. & Gilg is included here in *M. scabra* as a subspecies because its key differentiating character (all stamens are approximately equal in size) is also found in other specimens of *M. scabra*, but its small flowers, nearly spheroidal fruits, and very long internodes are sufficiently distinct to segregate it. The typical subspecies, subspecies *scabra*, is a shrub with persistent, dark bark. All other subspecies are subshrubs, with branches only occasionally persisting for more than one year, and all of them have pale, exfoliating bark. The only exception is a limestone population of *M. scabra* subsp. *chilensis* from the province Chota in northern Peru, which is also shrubby, but differs in its much smaller flowers and leaves. *Mentzelia scabra* subsp. *chilensis* and *M. scabra* subsp. *atacamensis* are apparently at least facultatively annual. Even after eight years in cultivation, plants of *M. scabra* subsp. *chilensis* have not produced a persistent bark and have retained their subshrubby habit (Weigend & Dostert 97/144b-C, cultivated in Munich 1997–2000 and in Berlin 2000–2005).

KEY TO THE SUBSPECIES OF *MENTZELIA SCABRA*

- 1a. Stamens of equal length (differing in length up to 1 mm); upper bracts subcircular to widely ovate, 5–15 mm diam.; petals 12–15 mm (only northern Chile) 7.1. *M. scabra* subsp. *atacamensis*
- 1b. Stamens distinctly unequal, outer ones $1.5\text{--}2\times$ longer than interior ones; upper bracts ovate to narrowly ovate, over 15 mm diam.; petals (15–)18–30 mm long (northern Chile, Argentina, north to Venezuela).
 - 2a. Capsules subsessile, ca. 14 mm long, with very long scabrid trichomes (1.5–2 mm); lamina (55–)70–120 mm, indistinctly lobed, coarsely serrate 7.2. *M. scabra* subsp. *boliviana*
 - 2b. Capsules usually less than 10 mm long, pedicellate if longer, with scabrid trichomes less than 1 mm long; lamina less than 55 mm long, if longer then distinctly lobed and/or shallowly serrate.
 - 3a. Inflorescence lax, i.e., internodes $1\text{--}7\times$ as long as subtending bracts 7.3. *M. scabra* subsp. *chilensis*
 - 3b. Inflorescence dense, i.e., internodes less than $1.5\times$ as long as subtending bracts.
 - 4a. Petals (10–)12–15 mm long (Argentina) 7.4. *M. scabra* subsp. *cordobensis*
 - 4b. Petals 20–30 mm long (Colombia and Peru).
 - 5a. Subshrubs with pale, exfoliating bark, stems basally less than 10 mm thick; petals 18–25 mm long; flowers with 60 to 70 stamens (only central Peru) 7.5. *M. scabra* subsp. *grandiflora*

- 5b. Shrubs with dark, lenticellate bark on basal stems, these 10–20 mm thick; petals 25–30 mm long; flowers with 100 to 120 stamens (only southern Colombia) . . . 7.6. *M. scabra* subsp. *scabra*

7.1. *Mentzelia scabra* Kunth subsp. *atacamensis* (Urb. & Gilg) Weigend, comb. et stat. nov. Basionym: *Mentzelia chilensis* Gay var. *atacamensis* Urb. & Gilg, Nov. Actorum Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 50. 1900. TYPE: Chile, Atacama: Atacama, *F. Philippi* 323 (lectotype, designated here, W!; isotypes, B†, SGO not seen). Figure 9.

Subshrub ca. 0.5 m tall; stem 4–8 mm thick basally, with pale, exfoliating bark. Leaves subsessile or shortly petiolate (lower leaves with petioles 5–10 mm); lamina widely ovate to subcircular, 15–25(–35) × 10–15(–22) mm, margin very shallowly lobulate to serrate (lobules usually less than 2 mm deep); base slightly decurrent on petiole, lower leaves with rounded base, upper with subcordate base. Inflorescences very lax; internodes 3–7× as long as subtending bracts; pedicels 2–5(–8) mm. Flowers with calyx tube covered with short glochidiate trichomes (0.1–0.5 mm) and longer scabrid trichomes (≤ 0.5 mm); calyx lobes 8–10 × 2–4 mm; petals ca. 15 × 8–10 mm; stamens 40 to 50, filaments 10–11 mm, all $\pm$ equally long. Capsule ovoidal, 5–8 × 5 mm.

Both the B and the W sheets were annotated by Urban and Gilg; the W collection, as the only extant set, is therefore chosen as lectotype. *Mentzelia scabra* subsp. *atacamensis* differs from the other subspecies of *M. scabra* in its subequal stamens, and this, together with generally less deeply lobed and smaller leaves, the very long internodes in the inflorescence, and the small flowers, was also the reason why Urban and Gilg (1900) segregated it as a variety. The specimens of *M. scabra* subsp. *chilensis* with subequal stamens from northern Peru clearly refer to subsp. *chilensis* because of their lobed leaves and narrower capsules, but their existence is the reason for not recognizing *M. scabra* subsp. *atacamensis* at species level.

Distribution and habitat. This subspecies is known from Regions II and IV in Chile and is also to be expected in Region III. It grows at elevations of 30–1000 (possibly to 3000) m, and is likely a facultative annual.

Additional specimens examined. CHILE. **II Región, de Antofagasta:** Taltal, Taltal, *Werdermann* 798 (B, E, G, M, MLO, Z), *von Bayern* 198 (M); 12 km SE of Taltal, *Charpin et al.* 1623612 (G); Quebrada Peralito, *Quezada & Ruiz* 392 (M); Lomas de Taltal, 7 km S of Taltal, *Ackermann* 481 (BSB, CONC, M, SGO); Cobija, *Gaudichaud* s.n. (G); Antofagasta, Quebrada Peralito, Paposo, 1.5 km N of Taltal, *Billiet & Jadin* 5545 (MO); near Taltal, *Zöllner* 14286 (MO); 7 km E of Taltal, *Eggli & Leuenberger* 1766 (B). **IV Región, de Coquimbo:** Elqui, Los Chiches, 3 km W of Vicuña, *Wagenknecht* 18449 (G, MO), *Worth & Morrison*

16344 (G, MO); Elqui, Punta N of Cerro Los Mantos, *Mahu* s.n. (MO); Illapel, *Geisse* s.n. (Z); Andacollo valley, *Elliot* 31 (E).

7.2. *Mentzelia scabra* Kunth subsp. *boliviana* Weigend, subsp. nov. TYPE: Bolivia, Cochabamba: Ayopaya, 2500 m, *S. G. Beck & R. Seidel* 14597 (holotype, LPB!; isotype, M!). Figures 10, 11A–E.

Haec subspecies *Mentzeliae scabrae* subsp. *chilensi* affinis, sed ab ea ovario trichomatibus longioribus usque ad 2 mm longibus instructo et habitu frutice maiore, foliis et floribus maioribus differt.

Shrub 0.6–1.2 m tall; stems 5–15(–20?) mm thick basally, with pale, strongly exfoliating bark. Leaves subsessile to shortly petiolate (lower leaves with petioles 3–7 mm), (55–)70–120 × 30–60 mm, not or very shallowly lobed, margin mucronate to serrate; base subcordate to subcuneate; apex acuminate. Inflorescences dense, internodes usually much shorter than subtending bracts; bracts ovate, 35–65 × 10–35 mm; pedicels 1–3 mm. Flowers with calyx tube with short glochidiate and scabrid trichomes to 2 mm long, calyx lobes 13–17 × 3–5 mm; petals ca. 25 × 20 mm; stamens 70 to 90, 10 outer ones markedly longer, 20–25 mm, inner ones only 10–15 mm. Capsule narrowly clavate, 14–17 × 5–6 mm, covered with scabrid and glochidiate trichomes, scabrid trichomes 1500–2500 μ m long, glochidiate trichomes ca. 150 (rarely to 600) μ m long.

Mentzelia scabra subsp. *boliviana* is readily recognized by its shallowly lobed or unlobed leaves with coarsely serrate margin (Fig. 10A) and especially by the long scabrid trichomes with a smooth apex on its ovaries and fruits (Fig. 11A–E). These trichomes differ both in length (1.5–2 mm vs. less than 1 mm in other subspecies) and apex (smooth vs. scabrid in other subspecies). The taxon is relatively widespread in Bolivia but has not yet been collected in adjacent Argentina, where it is replaced by *M. scabra* subsp. *cordobensis*, which has much smaller flowers and different indument on its ovaries.

Distribution and habitat. This subspecies is known only from Bolivia and grows in four of its departments at elevations of 2400–3200 m. It is probably a robust subshrub similar to *Mentzelia scabra* subsp. *chilensis*, from which it differs in both leaf size and ovary indument.

Paratypes. BOLIVIA. **Chuquisaca:** Nor Cinti, La Palma to El Chaco, Río Chico valley btw. Sucre & Puente Arce, *J. R. I. Wood* 8112 (LPB, M); Nor Cinti, rd. Padcoyo–Calapaya

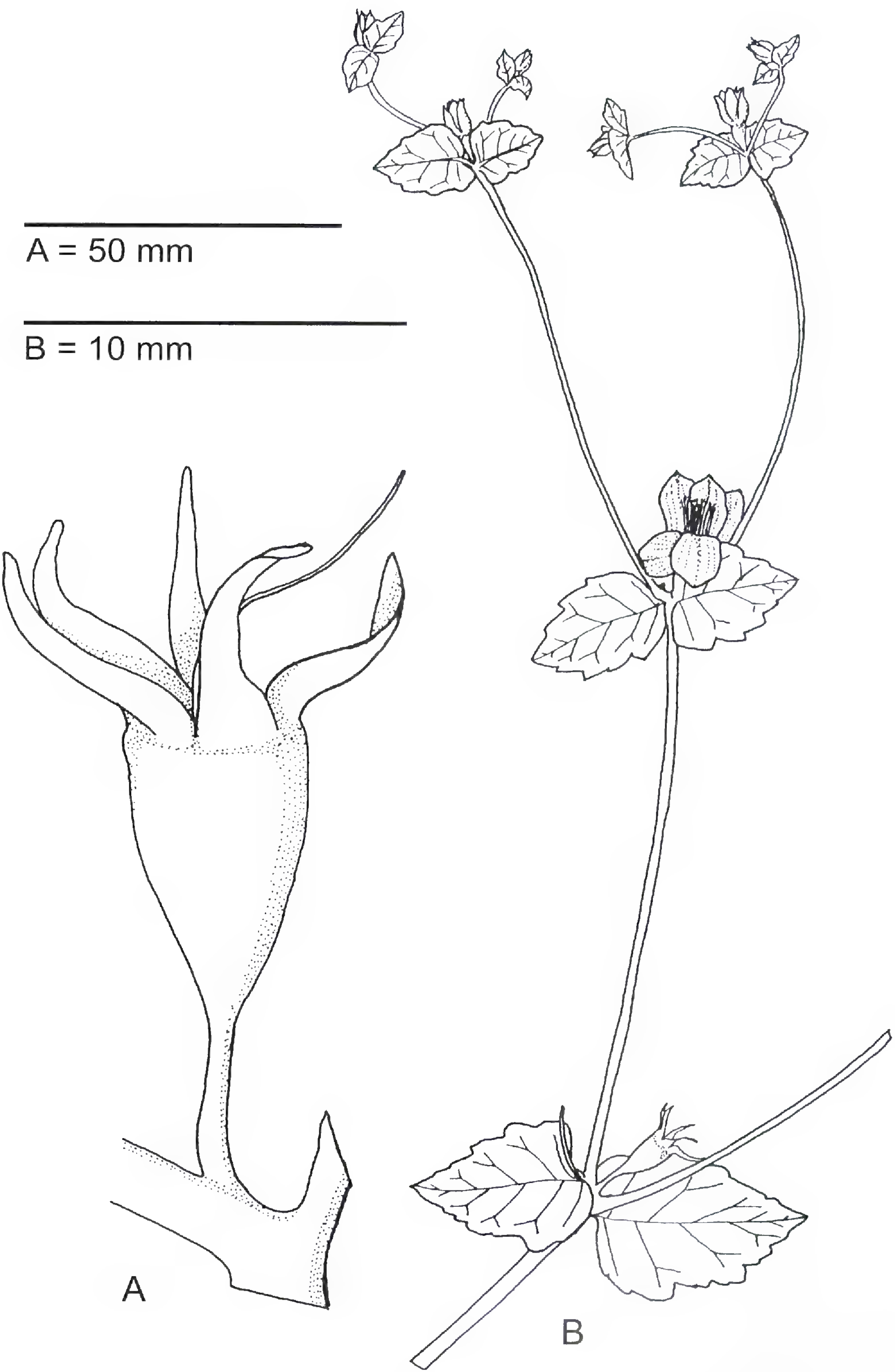


Figure 9. *Mentzelia scabra* subsp. *atacamensis*. —A. Inflorescence. —B. Young fruit. Drawn from Werdermann 798.



Figure 10. *Mentzelia scabra* subsp. *boliviana* Weigend. —A. Inflorescence (drawn from Wood *et al.* 15337). —B. Fruiting branch. —C. Fruit (drawn from Cárdenas 6082).

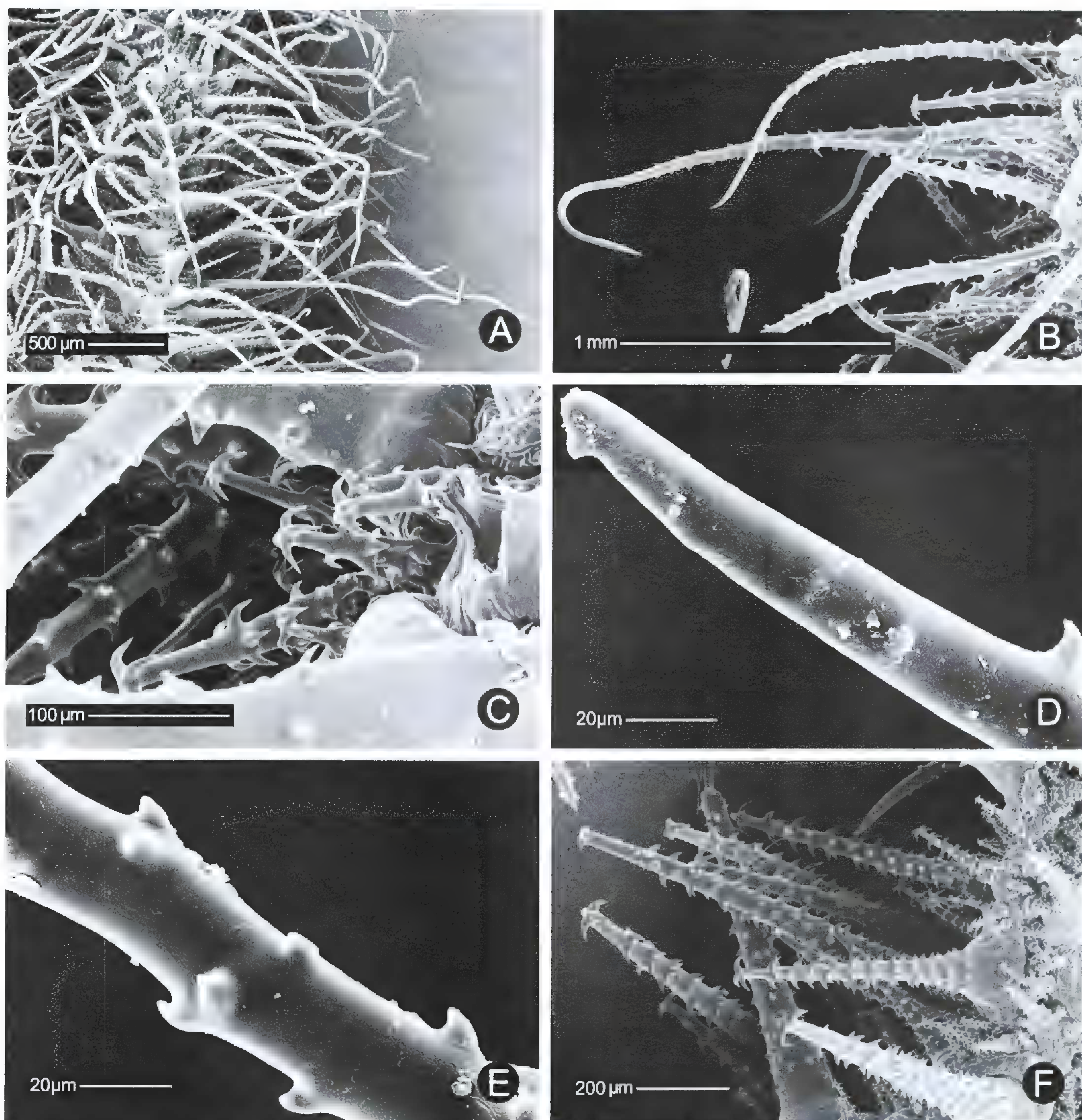


Figure 11. *Mentzelia scabra* subsp. *boliviana* Weigend. A–E. Indumentum on ovary. —A. Mixed indumentum showing very long scabrid trichomes and very short glochidiate trichomes. —B. Long scabrid trichomes and shorter glochidiate trichomes. —C. Apex of scabrid trichome. —D. Median portion of scabrid trichome. —E. Very short glochidiate trichome. —F. *Mentzelia hispida*. Mixed indumentum of long and short glochidiate trichomes. A from Ugent *et al.* 4997; B–E from Troll 1170; F from Flügel 9025, FR.

Betanazos, btw. Calapaya & Betanazos, *S. D. Smith & S. Leiva* G. 411 (F, HAO, LPB, MO); Azurduy, 10–15 km S of Tarvita on rd. to Sopachuy, *J. R. I. Wood, D. J. Goyder & M. Serrano* 15337 (LPB). **Cochabamba:** Arque, Río Arque, btw. Arque & Iguerani, *P. Ibisch* 156 (LPB); Ayopaya, *S. G. Beck & R. Seidel* 14597 (LPB, M); Mizque, path Chaguarani to Mina Asientos, Comunidad San Vicente, *A. López & E. Saravia* 402 (Cochabamba); Mizque, Quioma Silver Mines, *Eyerdam* 25337 (M); Cercado, Quebrada Chuncado, *N & M. Ritter* 2973 (MO). **Sucre:** Rd. Sucre to Cochabamba, Km 25, *M. Cardenas* 6082 (WIS); Oropeza, Sucre–Aiquile rd., 15 km ENE of Sucre, *D. & V. Ugent & M. Cardenas* 4997 (K, WIS). **Tarija:** Prov. Arce, La Merced, *R. Ehrich* 492 (LPB). **Province unknown:** Pucarasito, *C. Troll* 1170 (M).

7.3. *Mentzelia scabra* Kunth subsp. *chilensis* (Gay)
Weigend, comb. et stat. nov. Basionym: *Mentzelia chilensis* Gay, Fl. Chil. 2: 431. 1863. TYPE: Chile. Coquimbo: Mtns. of Arqueros, Piedra Colgada, *C. Gay* 265 (lectotype, designated here, P!; isotypes, P[3!]). Figures 12A–F, 13.

Mentzelia ignea (Phil.) Urb. & Gilg in Engl. & Prantl, Nat. Pflanzenfam. 3(6a): 110. 1894. Syn. nov. Basionym: *Loasa ignea* Phil., Anales Mus. Nac. Santiago de Chile [Verz. Antofagasta Pfl.]: 24. 1891. TYPE: [Chile. Tarapacá:] btw. Mocha & Guaviña, *F. Philippi* s.n. (holotype, SGO not seen; isotype, K!).

Mentzelia fendleriana Urb. & Gilg, Mem. Torrey Bot. Club 3: 34, 1893. Syn. nov. TYPE: Venezuela, Miranda: "prope coloniam Tovar," A. Fendler 1876 (lectotype, designated by Weigend, 1996b: 237, G!; isotypes, GH not seen, GOET!, MO not seen).

Mentzelia soratensis Urb. & Gilg, Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 68, 1900. Syn. nov. TYPE: Bolivia, [La Paz: Larecaja:] near Sorata, Munaypata, 2650 m, G. Mandon 621 (lectotype, designated here, BR!; isotypes, G-DEL!, GH not seen, NY!, P!, W!).

Subshrub, rarely shrub or shrubby annual, usually stiffly erect, rarely decumbent or climbing, 0.6–2 m tall; stems 5–20 mm thick basally; bark thin, pale grey or brown, strongly exfoliating in thin strips, rarely dark brown and persistent. Leaves subsessile to shortly petiolate (lower leaves with petioles 5–10 mm); lamina ovate, 15–75(–90) × 10–50(–65) mm, with 1–(2–3) ± distinct lobes on each side (unlobed), lobes triangular, triangular-ovate, or oblong, margin serrate; base subcordate to cuneate. Inflorescence lax, rarely dense; internodes 1–7× as long as subtending bracts; bracts ovate; pedicels 1–2(–4) mm. Flowers with calyx tube densely set with glochidiate and scabrid hairs 0.1–0.8(–1) mm long, longest hairs scabrid; calyx lobes 8–10(–20) × 2–3(–5) mm; petals (10–)14–18(–25) × (7–)10–12(–18) mm; stamens (50 to)70 to 90(to 100), 10 outer ones markedly longer, (8–)14(–20) mm, inner ones only (5–)6–11(–15) mm. Capsule obovoid, 6–12(–17) × 5–6(–7) mm, base rounded or conical, covered with scabrid and glochidiate trichomes, scabrid trichomes from 400–500 µm ("Cordillera Negra"), 600–750 µm (most specimens), to 800 µm long ("*Mentzelia soratensis*").

Four Gay specimens are deposited at P, and lectotypification is required for *Mentzelia chilensis*. One of the specimens is selected here. For *M. soratensis*, two different collections are cited by Urban and Gilg (1900). The best-preserved specimen (Mandon 621, BR) is selected here as the lectotype. Urban and Gilg (1900) also cited Pentland s.n. as syntype for *M. soratensis*, but I failed to locate the original material, which may have been housed in Berlin only. *Mentzelia scabra* subsp. *chilensis*, as understood here, includes *M. fendleriana*, *M. soratensis*, and *M. ignea*. The types of *M. chilensis* and *M. ignea* are from the same area in northern Chile, and two of the syntypes of *M. fendleriana* (Bang 748, 1082; see Weigend, 2000) and the types of *M. soratensis* are from the same area in Bolivia. The various species as recognized by Urban and Gilg (1900) and Darlington (1934) had very peculiar distribution patterns: *M. soratensis* was described from Bolivia by Urban

and Gilg (1900) and reported from Ecuador, Peru, and Bolivia by Darlington (1934), whereas the syntypes of *M. fendleriana* came from Venezuela and Bolivia, and Darlington (1934) subsequently reported the species from Venezuela, Ecuador, Peru, and Bolivia (i.e., both species appeared to have fully overlapping geographical ranges). *Mentzelia ignea* was described from Chile but reported from Chile and Peru by Urban and Gilg (1900), and their definition included material that was subsequently referred to *M. cordifolia* by Darlington (1934), whereas Darlington reported material of *M. cordobensis* (= *M. scabra* subsp. *cordobensis*) as belonging to *M. chilensis*. Thus, the confused taxonomic history corroborates that there may be no clear morphological characters that allow a segregation of the various species previously recognized. All my attempts to find any clear dividing lines among any of these taxa failed.

Additional specimens examined. **BOLIVIA. La Paz:** Bolivian Plateau, Bang 748 (E, MO, NY), Bang 1082 (NY); Larecaja, from Sorata toward Río San Cristóbal, Beck 18724 (LPB, M); Larecaja, Sorata, Troll 2413 (B, M); Larecaja, from Larecaja 10 km toward La Paz, Beck 8682 (LPB, M); Larecaja, SE of Sorata, Jardim 312 (MO); Murillo, SSE of La Paz, rd. to Nevado Illimani, from Palca 20 km toward Cohóni, Beck 8403 (LPB, M). **Potosí:** Bautista Saavedra, Km 61 above Millases on rd. to Betanzos, Wood 11252 (LPB). **Santa Cruz:** Florida, rd. Mairana to Yunga de Mairana, 2 km NE of Plaza Mayor, Nee 49332 (BSB, NY); Cordillera, Estancia Rancho Chico, Fuentes 2378 (MO). **Tarija:** E of Tarija, Fiebrig 2662 (G); Arce, La Merced, Ehrlich 138 (LPB, M). **CHILE: IV Región, de Coquimbo:** Ovalle, Río Ponio, Jiles 1888 (CONC, M). **COLOMBIA. César:** Serranía de Perijá, Mpio Augustin Codazzi, Rangel et al. 12301 (COL, M). **ECUADOR. Azuay:** 30 km S of Santa Isabel, rd. Pasaje to Santa Isabel to Girón, Harling & L. Andersson 14443 (GB); rd. Pasaje to Santa Isabel, Harling 25700 (GB); bridge over Río Leon, MacBryde 343 (QCA); S of Río León valley, Wiggins 10847 (MO). **Chimborazo:** Canyon of Río Chanchan near Huigra, Camp E-3191 (P); Chunchi to Sibambe, Faegerlind & Wibom 744 (S). **Imbabura:** Rd. Pimampiro to Shanshipampa, van der Werff & Gudiño 10958 (GB); N of Salinas, N of Ibarra, Juncoso 2232 (QCA); Salinas, Harling 4333 (S); valley of Río Ambi, Balslev & Quintana 955 (MSB, NY); btw. Salinas & Carchi, Holm-Nielsen & Jaramillo 28890 (MO). **Loja:** S of Algarroba, Catamayo valley, Øllgard et al. 71213 (LOJA, QCA); La Toma to Loja, Km 10, Madsen 75044 (LOJA, QCA); Río Comunidades, Vilcabamba to Yangana, Sparre 16136 (S). **Pichincha:** Rd. Guallatubo to Tabacundo, bridge over Río Pisque, Laegard 51844 (QCA, QCNE); rd. Guayllabamba to Tabacundo at bridge over Río Pisque, Laegard 51844 (QCA); Perucho, slope above village, Asplund 20333 (S). **Tunguragua:** Village of Pishilita, next to rd., Arguello 269 (NY, QCA); valley of Río Pillaro btw. Pillaro & Ambato, Asplund 8157 (GB, QCA, S, US); above Ambato, Balls 7148 (E), Cerón 5890 (QCNE). **Province unknown:** Andes of Ecuador, Pearce anno 1862 (K). **PERU. Amazonas:** Distr. de Luya, Santo Thomas, Quillay, Rojas & Vasquez 803 (BSB, MO); Bagua, btw. Bagua Chica & Limonyacu, Ferreyra 13651 (MO, MSB, USM); btw. Bagua Chica & La

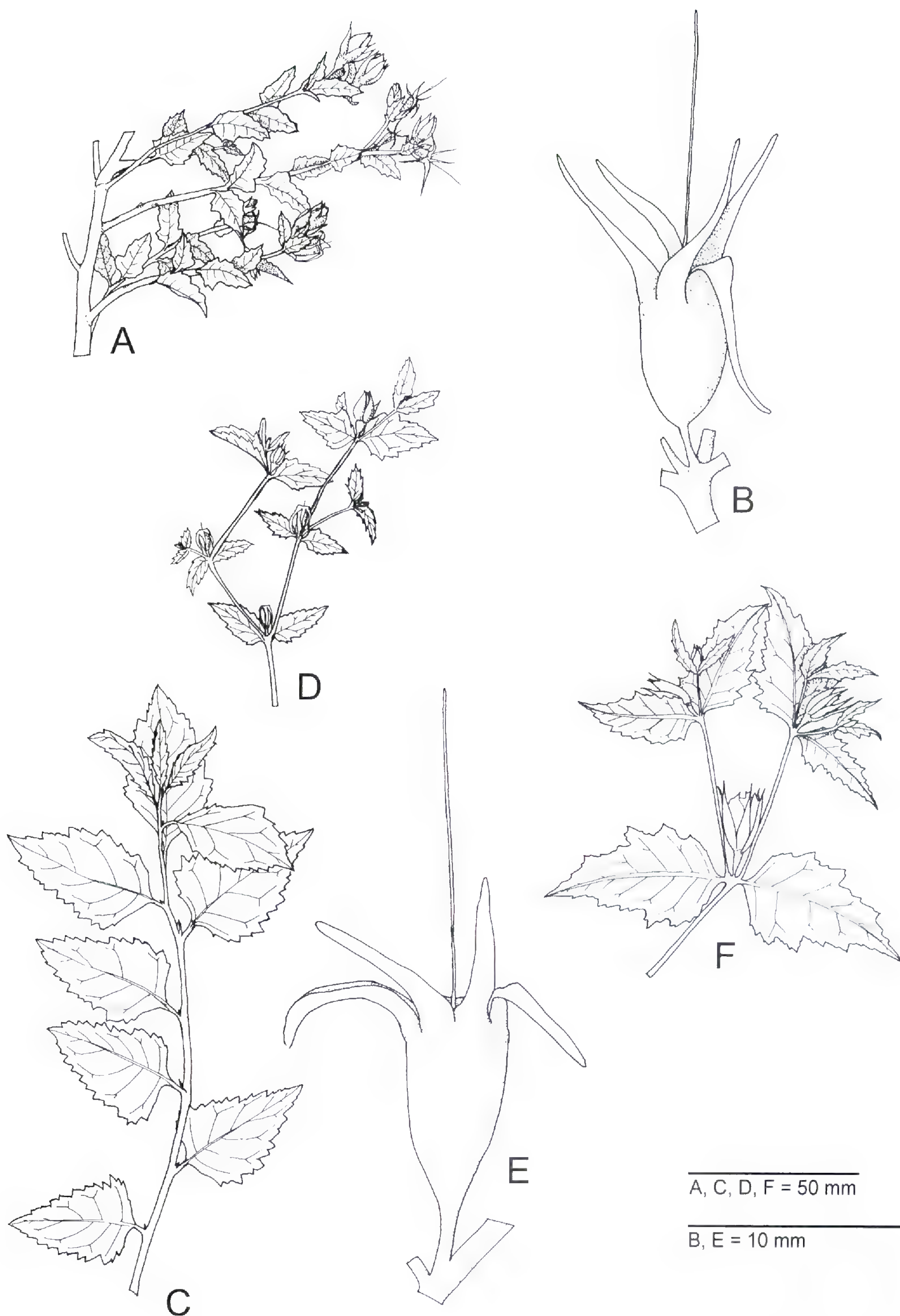


Figure 12. *Mentzelia scabra* subsp. *chilensis*. —A. Flowering shoot, “Chota” form (Peru, Dpto. Cajamarca, Prov. Chota, Weigend & Dostert 98/142). —B. Fruit (Weigend & Dostert 98/142). C–E. “Cordillera Negra” form (Weigend & Dostert 98/144b). —C. Young shoot with serrate leaf margins but without distinct leaf lobes. —D. Inflorescence. —E. Fruit. —F. Inflorescence, individual with serrate leaf margins (“*M. fendleriana*,” Venezuela, Rangel 12301).

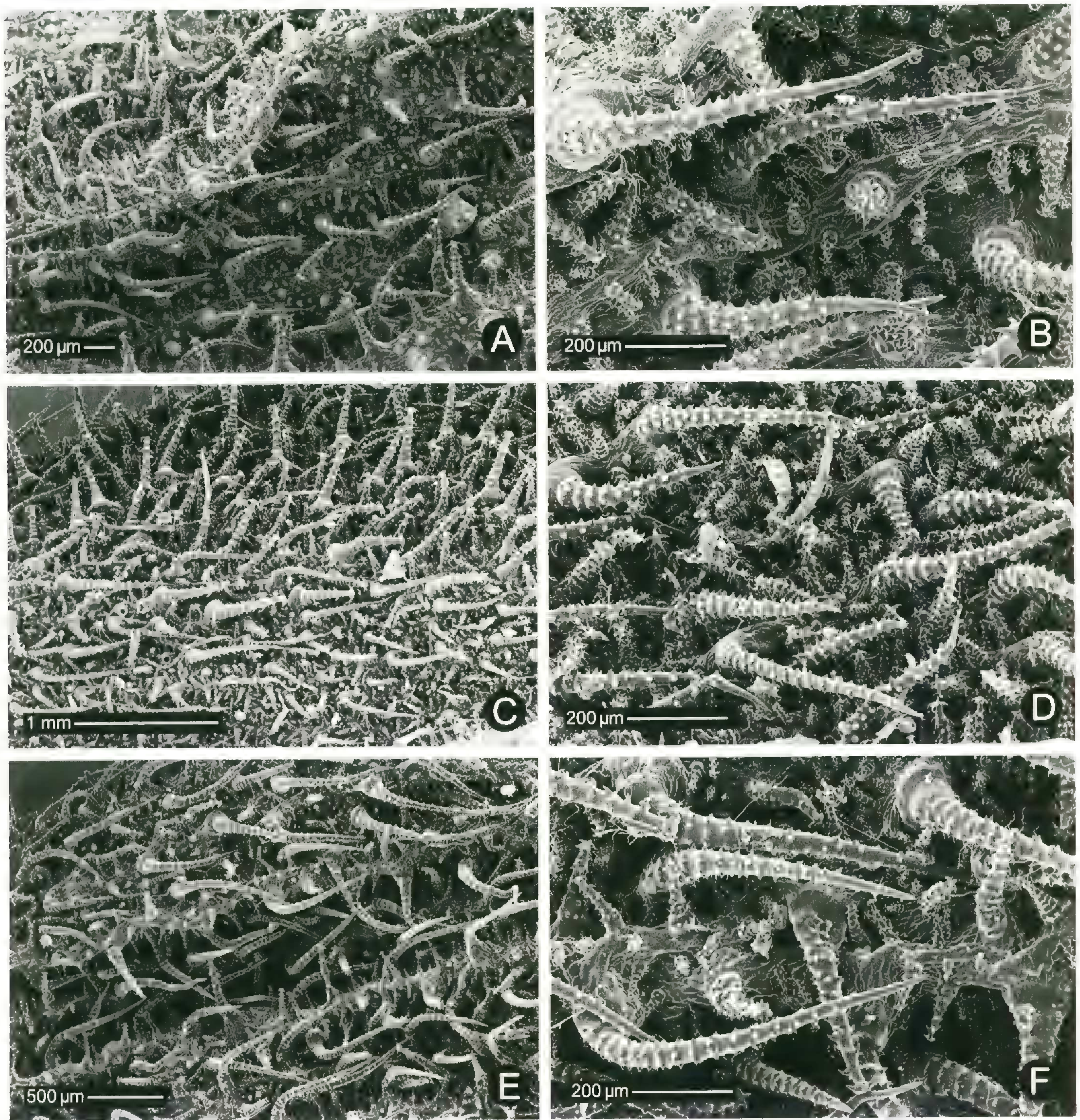


Figure 13. *Mentzelia scabra* subsp. *chilensis* indumentum on ovary and seed. A–B. “Cordillera Negra” form (Carillo 648). —A. Overview, mixed indumentum of long scabrid and shorter glochidiate trichomes. —B. Close-up of glochidiate and scabrid trichomes. C–D. “*M. soratensis*” (Weigend & Weigend 2000/171). —C. Overview, mixed indumentum of very long scabrid and short glochidiate trichomes. —D. Apex of scabrid trichome. E–F. Seed (Weigend & Dostert 97/144b). —E. Overview, note the irregularly angular shape. —F. Detail of testa, note the indistinct transverse striations and slightly thickened ends of the cells.

Peca, 1 km from Bagua, Dostert 98/87 (CPUN, F, MSB, USM); Camp. Milagro, Tillett 672-161 (USM); Chachapoyás, rd. Balsas to Leymebamba, Weigend et al. 98/315 (CPUN, F, M, USM); Chachapoyás, Chachapoyás city, Weberbauer 4360 (G, USM); near Chachapoyás, Ferreyra 14426 (MSB, USM); rd. Leymebamba–Chachapoyás, 7 km from Tingo toward Chachapoyás, Weigend et al. 98/385 (CPUN, F, M, NY, USM); from Leymebamba 3–10 km to Chachapoyás, Dostert 98/41 (CPUN, F, MO, MSB, NY, USM, W); from Tingo 2–10 km on rd. to Chachapoyás, Dostert 98/13 (CPUN, F, MSB, USM), Dostert 98/44 (CPUN, F, MSB, USM); rd. Leymebamba–Chachapoyás, 10 km from Leymebamba toward Tingo, Weigend et al. 98/375 (CPUN, F, M, NY, USM);

Chachapoyás, on dry slope overlooking Río Uteubamba, Hutchison & Wright 4979 (F, K, M, MICH, MO, NY, P, US, USM); 1 km from turnoff on Tingo–Kuelap rd., Sánchez & Dillon 9074 (CPUN, F, MO, MSB); rd. Chachapoyás to Mendoza, 13 km from Chachapoyás, Weigend et al. 98/389 (CPUN, F, M, NY, USM). **Ancash:** Carlos Fitzcarraldo, Yauya, rd. to San Francisco, Cano et al. 14488 (B, USM); Huari, near Pontó, Cano et al. 14920 (BSB, USM); Corongo, rd. Sihuas to Corongo–Mirador (Río Santa), Weigend & Schwarzer 8015 (BSB, HUT, USM); Huaraz, Río Grande/Río Chaccan, near Pariacoto, Weigend et al. 7695 (BSB, HUT, M, USM); Huaraz, below Punta Caillán on rd. to Casma, Ferreyra 14645 (MSB, USM); Santa, Lomas de Lupín, Ferreyra 13533

(USM); Pallasca, Conchucos, *Cano et al.* 15563 (BSB, USM); Yungay, Shupluy, path to Guitarrero, *Cano* 11330 (USM); Huaylas, Huata, rd. to Pamparomas, *Cano* 11060 (USM); Huaylas, 5 km from Caraz on rd. to Pamparomas–Moro, *Weigend et al.* 7659 (BSB, HUT, M, USM); Huaylas, Incapamaman, *Carrillo* 648 (MSB, USM); Pueblo Libre, *Cano et al.* 10977 (USM); Huaylas, Ullpan, Pamaparomas, *Albán* 6809 (M, USM); rd. Pamaparomas to Pampap, *Weigend & Dostert* 97/144b (F, HUT, K, M, MO, NY, USM, W); seeds from previous locality, cultivated at Munich, *Weigend & Dostert* 97/144b-C (BSB, M); opposite Mancos, Cerro Negro, *Smith & Bas* 4870 (USM). **Apurímac:** Abancay: 35 km SW of Abancay, Hac. Casinchihua, *Iltis et al.* 800 (WIS); Abancay, rd. from Abancay to Andahuaylas, banks of Río Pachachaca/Apurímac, near old bridge, *Weigend & Weigend* 2000/315 (HUSA, M, NY, USM); Grau, Kairaneka, *Vargas* 5827 (BSB, CUZ); Abancay, Matará, *Vargas* 10008 (MO). **Arequipa:** Caravelí, Km 630 Panam. S, 14 km N of Puerto Chala, *Iltis et al. s.n.* (WIS); Caravelí, Quebrada Atico, *FLSP* 1303 (MO); Caravelí, Km 621 Panam. S, 20 km N of Puerto Chala, *Iltis et al.* 1570 (WIS); Caravelí, Atico S of Chala, *Tovar* 2677 (MO, MSB, USM); Lomas de Atico, *Ferreira* 8888 (MO); Caravelí, Km 586 Panam. S, Lomas 6 km N of Atiquipa turnoff, *Weigend & Förther* 97/718 (F, MSB, NY, USM); Arequipa, *Stafford* D7 (K); above Arequipa, *Ferreira* 14284 (MSB, USM); Arequipa, slope toward Estanquillo Ahogado Chachani, *Arenas* 87 (USM); 4 km N of Arequipa, Chilinas, hills on SW side of Río Chilinas, *Solomon* 2788 (USM); Arequipa, Tiabaya, *Vargas* 9437 (BSB, CUZ); Arequipa, Tingo, *Vargas* 7906 (BSB, CUZ); Sánchez Cerro, *Cáceres et al.* 3011 (BSB, HUSA); Islay, Lomas of Mollendo, ca. 10 km NW of Islay, *Dillon & Dillon* 3956 (F, HUT, USM). **Cajamarca:** Cajabamba, rd. from Cajabamba to Cajamarca, 23 km from Cajabamba where the rd. drops to San Marcos, *Weigend et al.* 97/315 (F, HUT, K, MO, MSB, NY, US, USM, W); Jaén, rd. from Jaén to San Ignacio, 68 km from Jaén, *Weigend et al.* 98/470 (CPUN, F, M, USM); btw. Jaén & Puente Corral Quemado, *Ferreira & Sánchez* 19671 (USM); btw. Sallique and La Unión, *Campos et al.* 9917 (MO); Río Huancabamba & Río Chotano confluence, rd. Olmos to Río Marañón, *López et al.* 4097 (HUT); 2 km W of Cajamarca, *Hudson* 1097 (MO); Celendin, Llangat, *Mostacero* 964 (MO); Santa Cruz, 31 km from Santa Cruz on rd. to Catache, 3 km E of Catache, *Weigend et al.* 7543 (BSB, HUT, M, USM); Santa Cruz, 2 km from Santa Cruz on rd. to Catache, *Weigend et al.* 7534 (BSB, HUT, M, USM); Chota, Chota–Huambos rd., 26 km from Chota, *Weigend & Dostert* 98/145 (CPUN, F, M, USM); Chota, Chota–Huambos rd., 9 km from Chota, directly E of Lajas, *Weigend & Dostert* 98/142 (BSB, HUT, M, USM); Cajamarca, 1 km S of Jesús, *Sánchez & Sánchez* 7189 (CPUN, F); 3 km on rd. from Bambamarca to Paccha, near Chala, *Weigend & Dostert* 98/111 (CPUN, F, M, NY, USM). **Cuzco:** Urubamba, btw. Chincheros & Urquijos, *King et al.* 239 (K, MO, NY, USM); rd. from Urubamba to Puna Huanoa, *Ackermann & Kollehn* 265 (BSB, HUSA, M, USM); Ollantaytambo, Pachar, *Huamantupa et al.* 3632 (BSB, MO); Ollantaytambo, *Schwabe s.n.* (B); Urubamba Valley, *Salinas* 304 (BSB), *Herrera* 1529 (MO); Urubamba Valley, Yucay, *Herrera* 1366 (BM); Yucay, *Soukup s.n.* (USM #20608); near town of Urubamba, *Gade s.n.* (WIS); Huayocari to Yanacocha, NW of Cuzco, *Núñez* 7096 (MO); Pomatales, 52 km from Cuzco on railway to Quillabamba, *Núñez* 7285 (MO); Urubamba, beyond the river, *Müller & Gutte* 9435b (LPB); Calca, rd. from Yucay to Calca, *Weigend & Weigend* 2000/171 (HUSA, M, NY, USM); Calca, Calca, *Vargas* 964 (BSB, CUZ); Calca, 4 km from Pisac on rd. to Calca, *Hawkes et al.* 5148 (MO); Urubamba,

rd. from Urubamba to Ollantaytambo, *Weigend & Weigend* 2000/209 (HUSA, M, NY, USM); Chincheros, quebrada btw. Chinchero & Urquillos, *King et al.* 239 (USM); Anta, rd. from Curahuasi to Cuzco, before bridge over Apurímac river, *Weigend & Weigend* 2000/395 (HUSA, M, NY, USM); Limatambo, Cunyac, *Galiano et al.* 5042 (BSB, MO); Yucay, *Soukup* 10604 (USM); Convención, Quellomayo, *West* 8017 (MO); Urubamba, Distr. Huayllabamba, *Tupayachi* 927 (MO); Urubamba, Distr. Huayllabamba, *Tupayachi* 126 (MO). **Huancavelica:** Huaytará, Pisco–Ayacucho rd., *Weigend & Förther* 97/595 (F, MSB, USM); Huancavelica, Mejorada, btw. Izcuhaca & Acoria, *Tovar* 1017 (USM); Huallhuas, near Mejorada, *Tovar* 313 (USM); Huancavelica, rd. from Huancavelica to Palca, btw. Palca & Izcuhaca, *Weigend & Skrabal* 5861 (BSB, HUT, M, USM); Huancavelica, 5 km E of Mejorada, *Stork & Horton* 10911 (MO). **Junín:** Huancayo, betw. Huancayo & Mejorada, *Hjerting & Petersen* 1384 (USM). **La Libertad:** Huamachuco, Hac. Cochabamba, *López* 1441 (MSB, USM); Hac. Cochabamba, *Lopez & Sagástegui s.n.* (HUT 2789); Otuzco, above Río Pollo, *Rodríguez et al.* 2239 (HUT, M, USM), *Rodríguez et al.* 2236 (HUT, M, USM), *Rodríguez et al.* 2237 (HUT, M, USM); localidad Nambuque, above La Cuesta, *Rodríguez et al.* 2248 (HAO, HUT); Cerro Chologday, *Binder et al.* 1999/198 (HUT); above Río Pollo, *Binder et al.* 1999/211 (HUT, M, USM), *Binder et al.* 1999/212 (HUT, M, USM); Samne, *López s.n.* (HUT 987); Samne, *Angulo s.n.* (HUT 1424); Membrillar, Otuzco, *López s.n.* (HUT 1530), *Ridout s.n.* (HUT 354); Membrillar–Llaguén, *López s.n.* (HUT 1439); Pataz, btw. Buldibuyo & Huylillas, *Sagástegui et al.* 17327 (BSB, HUT); Pataz, *Sagástegui et al.* 17283 (B); Buldibuyo to Tayabamba, *Weigend & Schwarzer* 8008 (BSB, HUT, USM); Alpamarca near Retamas, *Sagástegui et al.* 17283 (BSB, HUT); Trujillo, Cerro Chiputur, *Angulo & López s.n.* (HUT 1186), *López & Sagástegui* 9165 (HUT, MO), *Sagástegui & Mostacero* 11041 (HUT), *Mostacero et al.* 766 (HUT); Cerro Campana, *Angulo s.n.* (HUT 2020), *Angulo & López s.n.* (HUT 715); Cerro Cabezón, *Mostacero et al.* 766 (F, HUT), *Mostacero et al.* 1482 (HUT), *Sagástegui & López* 11021 (HUT), *Sagástegui & Mostacero* 10472 (HUT); Simbal, *Mostacero et al.* 715 (HUT); Laredo to Samne, *Angulo s.n.* (HUT 1314). **Lambayeque:** Chiclayo, Cerros de Tinajones, near Chonggoyape, *Cerrate de Ferreira* 5257 (MSB, USM); Sapotal (Motupe), *Llatas* 746 (HUT); Ferreñafe, rd. from Batán Grande to Incahuasi resp. Ullurpampa (syn. Uyurpampa), just beyond Laquipampa toward Incahuasi, *Weigend et al.* 8539 (B, HUT, USM); Sapotal near Motupe, *Llatas-Quiroz* 746 (MO). **Lima:** Cajatambo, above Churín, *Ferreira* 3514 (USM); Chancay, near Trapiche, *Ferreira* 19146 (MSB, USM); Huamantanga, *Barclay* 2310 (BM); Canta, S base of Huachoc Pass, 20 km N of Trapiche, *Hutchison* 1025 (G, K, USM); Purrochuco, *Mathews* 596 (E, G, K); Lima, btw. Trapiche & Huaral, *Ferreira* 11766 (USM); Huarochiri, below Langa, *Ferreira* 19066 (USM); Yauyos, rd. from Yauyos to Jauja, after Magdalena, *Weigend et al.* 7240 (BSB, HUT, M, USM). **Moquegua:** Mariscal Cáceres, Torata, Quele, *Arakaki* 281 (USM); 14 km E of Moquegua on rd. to Torata, *Weigend & Förther* 97/847 (F, M, NY, USM); Quebrada de Torata, *Núñez* 13 (USM); Sánchez Cerro, Río Amarillo, *Cáceres* 3010 (BSB, HUSA); Torata, *Hufford & McMahon* 3836 (USM); Sánchez Cerro, Omate, *F. Cáceres H.* 3237 (BSB, HUSA); rd. Omate to Arequipa, *Weigend & Schwarzer* 7872b (BSB, HUT, USM). **Piura:** Huancabamba, rd. betw. Huancabamba & Sondor, *Weigend & Dostert* 98/202 (CPUN, F, M, USM); Huancabamba, btw. Huancabamba & La Cabeza, *Yarupaitán* 1406 (USM). **San Martín:** Distr. Huallaga, valley of Río Abiseo,

30 km above Jucusbamba, *Hamilton & Holligan* 2013 (K). **Tacna:** Tarata, 78 km from Candarave on rd. to Tarata, 211 km W of Ilave, *Weigend & Förther* 97/798 (F, MSB, NY, USM). VENEZUELA. **Falcón:** Bolívar, limestone ridges, *van der Werff & Wingfield* 7465 (BSB, MO). **Mérida:** Ejido to San Juan de Acequias, *Tillett et al.* 939-20 (MYF). **Monagas:** Btw. El Guácharo & La Cueva del Guácharo, *Bunting* 2654 (MO). **Trujillo:** Btw. Timotes & Valera, *Oberwinkler* 14283 (M); hwy, Valera to Timotes, 1 km SW of jct. to La Mesa rd., *Steyermarck & Manara* 125358 (M).

7.4. *Mentzelia scabra* Kunth subsp. **cordobensis**

(Urb. & Gilg ex Kurtz) Weigend, comb. et stat. nov. Basionym: *Mentzelia cordobensis* Urb. & Gilg ex Kurtz, *Revista Mus. La Plata, Secc. Paleontol.* 5: 289, 1893. TYPE: Argentina. Córdoba: Totoral, Sierra Chica de Córdoba, close to Ascochinga, *P. G. Lorentz* 265 (lectotype, designated here, GOET!; isotypes, BA not seen, K not seen). Figures 14, 15A, B.

Subshrub 0.6–0.8 m tall, stems 5–10? mm thick basally, with pale, strongly exfoliating bark. Leaves subsessile or shortly petiolate (lower leaves with petioles 5–7 mm), lamina (40–)55–70 × 20–40 mm, undivided or with one indistinct, round lobe on each side proximally, margin deeply or shallowly, irregularly serrate to lobulate; base truncate to cuneate; apex acuminate. Inflorescences dense; internodes 0.5–1(–2) × as long as bracts; pedicels 1–4 mm. Flowers with calyx tube with scabrid and glochidiate trichomes 0.1–0.6 mm long, longer trichomes both glochidiate and scabrid; calyx lobes 8–12 × 2 mm; petals (10–)12–15 × 10 mm; anthers ca. 60, outer ones markedly longer, ca. 10 mm, inner ones 5–6 mm. Capsule obovoid from conical base, 9–12 × 3–5 mm, covered with both scabrid (to 500 µm) and glochidiate (to 400 µm) trichomes.

Several extant potential type specimens exist: additional specimens cited with the protologue are *G. Hieronymus s.n.* and *O. Kuntze* 7263, both of which were apparently housed in Berlin and are now lost. Sleumer (1955: 418) referred to the Berlin specimen of *P. G. Lorentz* 265 as type (F-10123, photo), which he had seen before the fire in Berlin in March 1943 destroyed it (Hiepko, 1987). Lectotypification is required, and the specimen from GOET is therefore selected here. *Mentzelia scabra* subsp. *cordobensis* is morphologically similar to *M. scabra* subsp. *chilensis*, its northern neighbor. However, the flowers (especially the petals) are smaller, the inflorescences are very dense, and the leaves are relatively large, membranaceous, and shallowly lobed. The precise geographical limits between the two subspecies are still poorly understood, but the southernmost representative specimen of *M. scabra* subsp. *chilensis* I have seen

is from the department Tarija in Bolivia. Whether subspecies *cordobensis* is really absent from Bolivia is still unclear. According to the material seen so far, the subspecies is restricted to northwestern Argentina at elevations of 500–1800(–2600) m.

Additional specimens examined. ARGENTINA. **Córdoba:** Totoral, Casa Bamba, Sierra Chica de Córdoba, *Stuckert* 3679 (G); Casa Bamba to El Dique San Roque, Quebrada del Río Primero, *Tirel* 293 (G), *Hunziker* 7007 (G); Colon, Sierra Chica, *Lossen* 163 (M, MO), *Lossen* 293 (M); Calamuchita, Dique de los Molinos, *Krapovickas & Cristóbal* 14708 (WIS); Colon, Sierra Chica, 5 km W of La Calera, *J. & A. Solomon* 4067 (MO); Colon, Salsipuedes, *Hunziker* 1466 (MO). **Jujuy:** Dpto. Tumbaya, below Tilcará, btw. Volcán & Puente de León, *Beck & Paniagua* 26668 (BSB, LPB); Santa Bárbara, *Deginani et al.* 905 (MO). **Salta:** Viña, Quebrada de las Conchas, btw. Salamanca & El Hongo, rte. 68, Km 77–78.5, *Novara & Bruno* 9615 (M); Dpto. Rosario de Lerma, Quebrada del Toro, rte. 51, Km 32.7, 7 km W of Quijano, *Novara* 7521 (M), *Novara* 6471 (Z); Rosario de Lerma, Quebrada del Toro, *Sleumer* 2000 (B); Guachipas, Quebrada del Cebillar, 9.2 km SE from La Viña, *Krapovickas & Schinini* 30619 (G). **Tucumán:** Burruyacu, Nogalito, Quebrada de las Asperezas near Los Pinos, *Verveorst* 6785 (BR, W).

7.5. *Mentzelia scabra* Kunth subsp. **grandiflora**

(G. Don) Weigend, comb. et stat. nov. Basionym: *Mentzelia grandiflora* G. Don, *Gen. Hist.* 3: 66, 1834. TYPE: Tab. 451 in Ruiz & Pavón, *Anales Inst. Bot. Cavanilles* 16 [Fl. Peruv. 5]: 424, 1958. Figure 15C, D.

Mentzelia cordifolia Dombey ex Urb. & Gilg, *Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur.* 76: 74, 1900. Syn. nov. TYPE: [Peru, Lima:] *J. Dombey* 747 (lectotype, designated here, P!; isotypes, B†, G!).

Subshrub ca. 1 m tall; stems 5–9 mm thick basally, with pale exfoliating bark. Leaves subsessile to shortly petiolate (lower leaves with petioles 3–7 mm), 30–50 × 25–30 mm, irregularly lobulate, margin irregularly serrate to mucronate; base subcordate; apex acuminate. Inflorescences dense; internodes ca. 1.5–3 × as long as subtending bracts; pedicels 1–2 mm. Flowers with calyx tube with a mixture of glochidiate and scabrid hairs 0.1–1 mm long, longest trichomes mostly glochidiate; calyx lobes ca. 10 × 3 mm; petals 18–25 × 8–14 mm; stamens ca. 60; 10 outer ones markedly longer, ca. 13 mm, inner ones 5–6 mm. Capsule ovoidal with conical base, ca. 8 × 5–6 mm, covered with scabrid and glochidiate trichomes, only few scabrid trichomes (700–800 µm), all other trichomes glochidiate (200–800 µm).

This subspecies of *Mentzelia scabra* was the second species to be described in the group in South America, and its correct name has been completely overlooked so far. In herbaria (and Brako & Zarucchi, 1993), it is generally called *M. cordifolia* Dombey ex



Figure 14. *Mentzelia scabra* subsp. *cordobensis*. —A. Flowering branch. —B. Inner stamen. —C. Outer stamen. —D. Petal. —E. Sepal. Drawn from *Novara & Bruno 9615*.

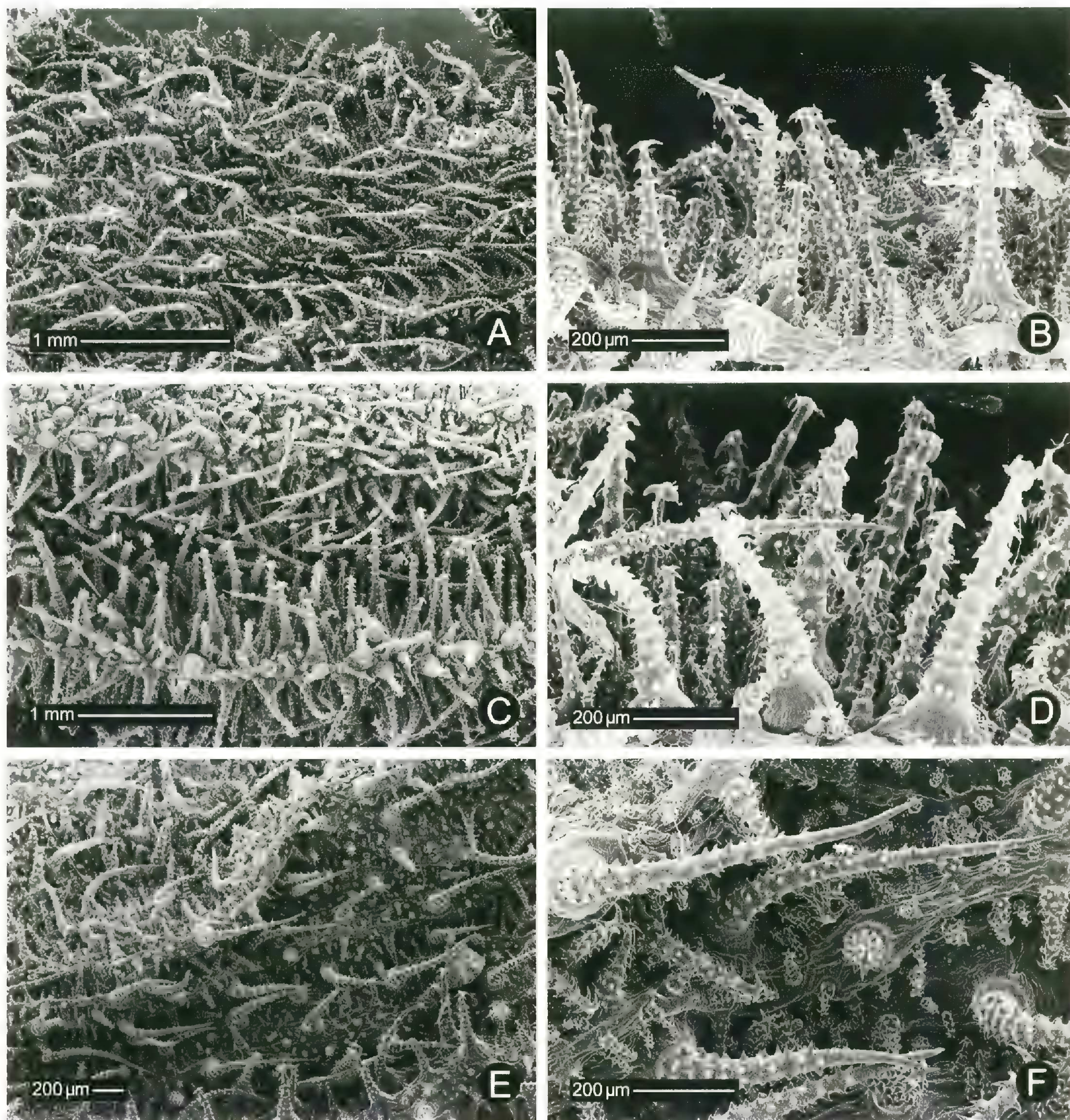


Figure 15. *Mentzelia scabra* subsp. *cordobensis*, subsp. *grandiflora*, and subsp. *scabra* indumentum on ovary. A–B. *M. scabra* subsp. *cordobensis*. —A. Overview, mixed indumentum with predominantly glochidiate trichomes (Novara & Bruno 9615). —B. Close-up showing a few scabrid trichomes (Krapovickas & Cristóbal 14708). C–D. *M. scabra* subsp. *grandiflora* (Beigmann s.n.). —C. Overview, mixed indumentum of mostly glochidiate trichomes. —D. Close-up of mostly glochidiate trichomes. E–F. *M. scabra* subsp. *scabra* (Ramírez 1917). —E. Overview, mixed indumentum of long scabrid and shorter glochidiate trichomes. —F. Close-up of glochidiate and scabrid trichomes.

Urb. & Gilg (or erroneously *M. cordifolia* Dombey), and that name has been indiscriminately used for nearly all suffrutescent *Mentzelia* species in Peru. *Mentzelia grandiflora* G. Don is the oldest name for that taxon, and it was directly based on the then-unpublished plate produced for *M. fulva* Ruiz & Pav. (Ruiz & Pavón, 1958: 424) for the *Flora Peruviae et Chilensis*. Don is thus the sole author of the species (not *M. grandiflora* Ruiz & Pav. ex G. Don, since George Don did not use the specific epithet “*fulva*”). The type collections of *M. fulva* and *M. cordifolia* are

both from the Lomas de Chancay, where they were collected jointly by Dombey, Ruiz, and Pavón y Jiménez. There can therefore be no doubt about the synonymy of these three names. The names have been interpreted differently in the past, and Darlington (1934) mistakenly refers the material relegated here to *M. angurata* to *M. cordifolia* (e.g., J. F. Macbride & W. Featherstone 130, J. F. Macbride 3215, J. McLean s.n., F. W. Pennell 14472). Due to the presence of several extant potential type specimens, lectotypification for *M. cordifolia* is required. It is here lectotypified on the

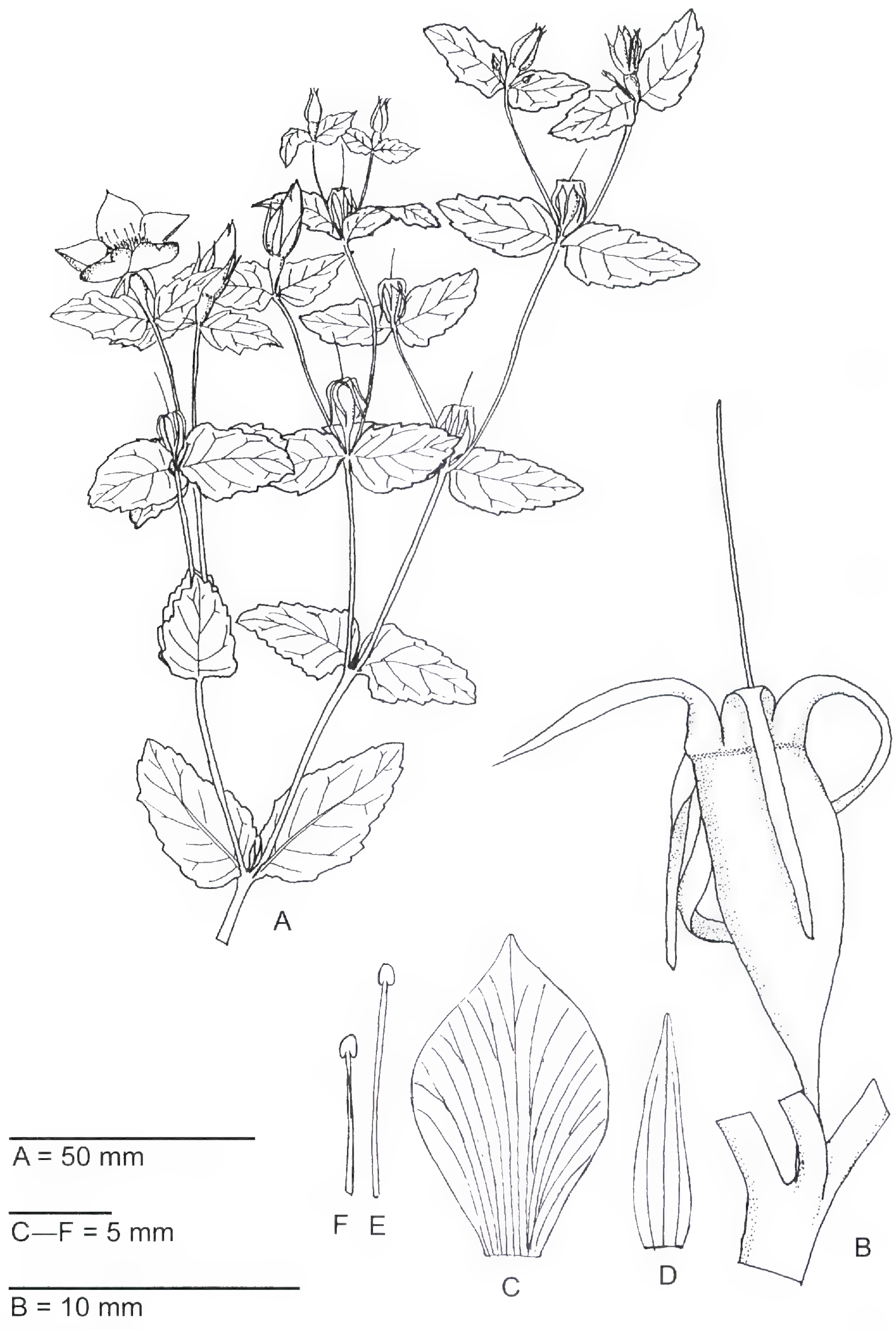


Figure 16. *Mentzelia sericea* Weigend. —A. Flowering branch. —B. Fruit. —C. Petal. —D. Sepal. —E. Outer stamen. —F. Inner stamen. From *Dostert 98/137*.

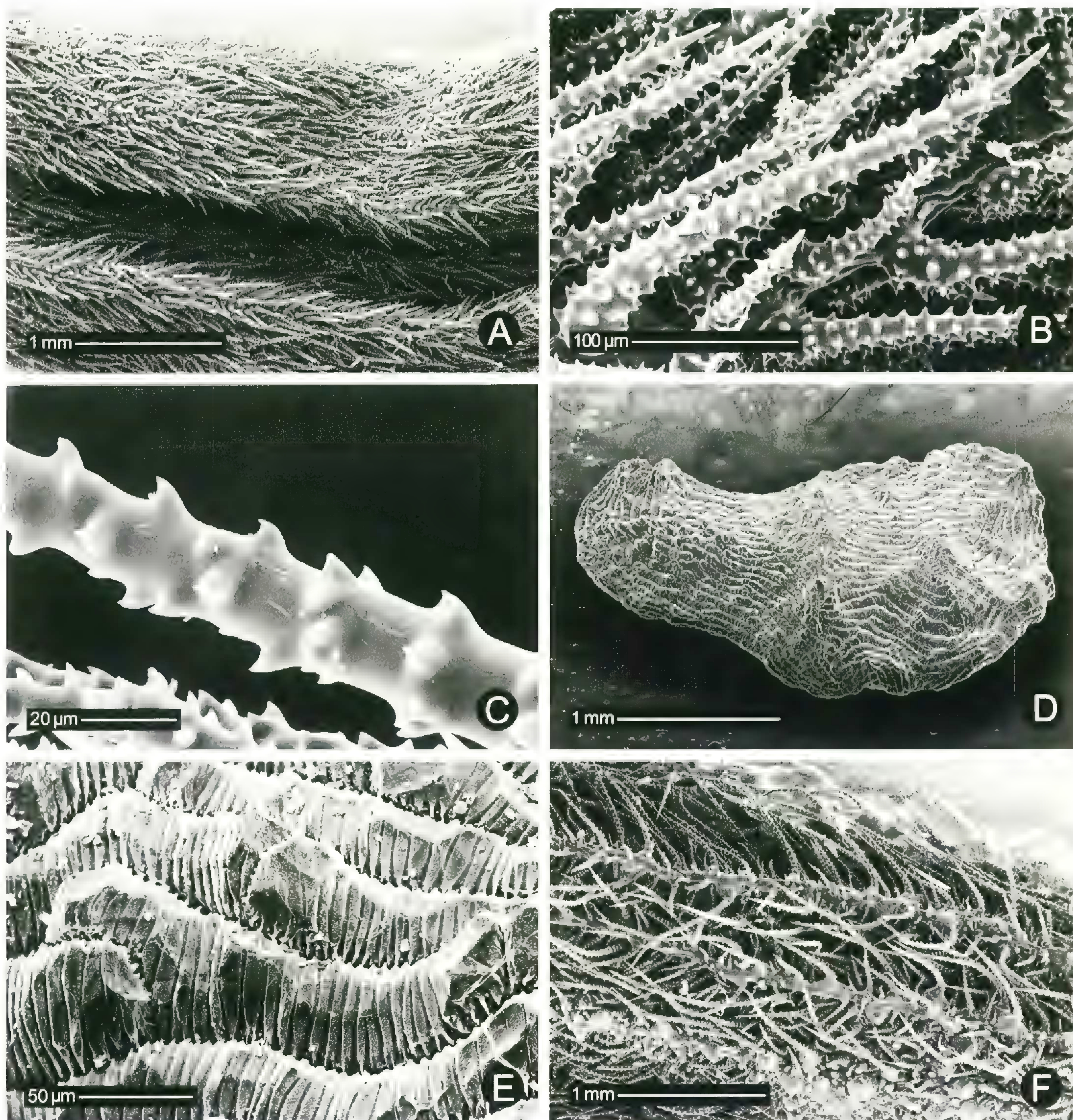


Figure 17. *Mentzelia sericea* Weigend and *M. sericea* $\times$ *M. scabra* subsp. *chilensis*, indumentum on ovary and seed. A–C. *Mentzelia sericea*, indumentum on ovary. —A. Overview, more or less homogeneous indument of short scabrid trichomes (Ferreyra 19914). —B. Close-up of densely overlapping acroscopic scabrid trichomes (Weigend et al. 7468). —C. Median portion of scabrid trichome (Ferreyra 19914). D, E. *Mentzelia sericea*, seeds (Dostert 98/137). —D. Overview, note the irregularly angular shape. —E. Detail of testa, note the indistinct transverse striations and slightly thickened ends of the cells.

F. Putative natural hybrid of *M. scabra* subsp. *chilensis* $\times$ *M. sericea* (Weigend et al. 98/527), indumentum on ovary, showing the predominance of acroscopic, scabrid trichomes (as in *M. sericea*), but they are relatively widely spaced and interspersed with scabrid and glochidiate trichomes (as in *M. scabra* subsp. *chilensis*).

specimen at P, which was seen and annotated by Urban and Gilg (1900).

Mentzelia scabra subsp. *grandiflora* is relatively poorly documented, but we fortunately managed to re-collect the taxon in 2002, which contributed much to our understanding of the subspecies. It is primarily defined by the combination of relatively large leaves and flowers, and by the predominance of glochidiate trichomes on its ovaries, but otherwise is very similar to *M. scabra* subsp. *chilensis*.

Distribution and habitat. *Mentzelia scabra* subsp. *grandiflora* grows at the lowest elevations, by far, of any subspecies of *M. scabra* and is the only form that is apparently found in the wet lower part of the seasonal coastal lomas formation in Peru. In lomas where both *M. scabra* subsp. *chilensis* and *M. scabra* subsp. *grandiflora* are found, the former is restricted to the upper limit of the lomas formation (800–1200 m) in sandy soils, whereas the latter is found between rocks at elevations below 400 m.

Additional specimens examined. PERU. **Arequipa:** Islay, Lomas de Mollendo, 10 km NW of Islay, *Dillon & Dillon* 3956 (USM). **Lima:** Lima, Lomas de Amancaes, *Pavón s.n.* (G); Lomas de Manchay, Valle de Lurín, *Beigman s.n.* (USM); Lomas de Manchay, *Ferreya* 9585 (USM); Prov. Cañete, Lomas de Asia, *Ridout s.n.* (USM #13032); Chancay, Lomas de Chancay, *Ferreya* 8677 (M, USM); Yauyos, rd. from Quilmaná to Km 122 of Panamericana Sur, Lomas de Quilmaná, *Weigend et al.* 7348 (BSB, USM).

7.6. *Mentzelia scabra* subsp. *scabra* Kunth. Figure 15E, F.

Strongly branched shrub 0.8–2 m tall; stems 10–20 mm thick basally, bark dark brown to grey with pale lenticels, not exfoliating. Leaves subsessile to shortly petiolate (lower leaves with petioles up to 20 mm); lamina widely ovate, 55–150 × 35–70 mm, margin irregularly serrate to lobed, lobes short (incision less than 1/3 of distance to midvein). Inflorescence dense; internodes shorter than or as long as bracts; pedicels 2–3 mm. Flowers with calyx tube densely set with scabrid and glochidiate hairs 0.1–0.7 mm long, the longest trichomes mostly glochidiate; calyx lobes 8–10 × 2 mm; petals 25–30 × 14–16 mm; stamens (80 to) 100 to 120, outer ones ca. 18 mm, inner ones 10–13 mm. Capsule subsessile, obovoid, 10–14 × 5 mm, covered with scabrid trichomes ca. 600–800 µm long with a long smooth apex and glochidiate trichomes ca. 200–300 µm long.

Mentzelia scabra subsp. *scabra* appears to be rather narrowly endemic to southern Colombia, with all collections coming from more or less the same place. *Mentzelia scabra* subsp. *scabra* is geographically intercalated between the Venezuelan and Ecuadorean populations of *M. scabra* subsp. *chilensis*, but differs from that subspecies by the shorter internodes in the inflorescence, shrubby habit with persistent bark, wider petals, more numerous anthers, and larger leaves. This taxon is more poorly defined than the other subspecies, and better and more complete collections are clearly desirable. Its closest affinities are with *M. scabra* subsp. *chilensis*, which differs by having smaller flowers with fewer stamens and/or by its subshrubby habit. This subspecies is found in relatively moist situations in Andean scrub communities in Colombia at elevations of ca. 2000 m.

Additional specimens examined. COLOMBIA. **Nariño:** Mpio. Taminango, 58 km from Pasto to Popayán, near El Tablón, *Ramírez* 1917 (MSB, PSO); btw. Túquerres & Pasto, *Triana s.n.* (G, P), *Triana* 5111 (COL); valley of Guaitará, *Weigend & Ramírez s.n.* (COL, M, PSO), *López-Palacios & Idrobo* 3778 (COL); Yacuanquer, *Fábrega* 520 (COL); Imués, Km 2 W of El Pedregal, *Gentry et al.* 64397 (PSO); Imués, Corregimiento El Pedregal, bridge of Guaitará, *de Benavides* 6426 (PSO); San José, bridge over Río Juanambú, *de Benavides* 5242

(PSO); Taminango, Km 58 Pasto–Popayán, near Tablón, *Ramírez* 1917 (PSO); Tangua, Vereda Tapialquer Bajo, *Ramírez* 5312 (PSO); Yacuanquer, Vereda de Tasnaque, *Ramírez* 614 (PSO). **Province unknown:** *Humboldt & Bonpland s.n.* (P); San Pablo, *Humboldt & Bonpland* 3520 (P).

8. *Mentzelia sericea* Weigend, sp. nov. TYPE: Peru. Cajamarca: Contumazá, rd. Contumazá to Chilete, 2500 m, *M. Weigend, N. Dostert & K. Drießle* 97/452 (holotype, USM!; isotypes, CPUN!, F!, M!). Figures 16, 17A–E.

Haec species *Mentzeliae scabrae* affinis, sed ab ea ovario trichomatibus scabridis, albis, appressis, usque ad 0.5 mm longis instructo differt.

Shrub 0.6–0.8 m tall, stiffly erect; stems basally 5–15 mm thick, lignescent, extremely brittle, with pale, strongly exfoliating bark, young shoots densely covered with glochidiate and scabrid trichomes. Leaves petiolate, petioles 2–15 mm, upper leaves subsessile; lamina ovate, 40–75 × 20–55 mm, shallowly lobed or only irregularly mucronate or serrate; base subcordate to subcuneate; apex acuminate. Inflorescence frondose, lax, widely branched (branching angle between paraclades of dichasia less than 90°); internodes 2–5× as long as subtending bracts (up to 15 cm); bracts 10–35 × 5–20 mm; pedicels 1–3 mm. Flowers with calyx tube conical, ca. 5 × 2 mm, densely covered with appressed scabrid trichomes; calyx lobes 11–12 × 3 mm, long-acuminate from narrowly ovate base; petals widely obovate, 20 × 15 mm, base narrowed, apex apiculate, golden yellow to pale orange; stamens 70 to 90, 10 outer ones markedly longer, ca. 18 mm, inner ones only 10–13 mm, anthers ca. 1 × 0.75 mm. Capsule clavate, 10–14 × 5 mm, densely covered with appressed, scabrid trichomes 300–500 µm long, lustrous, white.

Mentzelia sericea has a very characteristic indumentum of appressed scabrid trichomes on both ovary and fruit and is thus immediately recognizable. *Mentzelia angurate*, which also has only scabrid trichomes, is easily distinguished by its many trichomes to 1.5 mm long, globose (vs. clavate) capsules, a yellow, erect (vs. white, appressed) indumentum, and decumbent (vs. erect) habit. It remains unclear whether *M. sericea* is more closely allied to *M. angurate* or *M. scabra*, but it is more similar in habit to the latter (stiffly erect, not decumbent as *M. angurate*), and the loss of one trichome type may well be homoplastic. Phylogenetic analyses will be required to clarify its affinities.

Distribution and habitat. *Mentzelia sericea* is apparently endemic to northern Peru, and all collec-

tions known so far come from the neighboring departments Lambayeque, La Libertad, and Cajamarca. It is restricted here to the Pacific slope of the Andes and is replaced by *M. scabra* subsp. *chilensis* in all the inner-Andean valleys. There are a few intermediate specimens that have an anisotrichous indument of scabrid hairs that are mostly 1 mm long and interspersed with some shorter trichomes. The trichomes are also not as strictly appressed as is typical of *M. sericea*. These specimens (Soriano & Guevara 436, Sánchez 3849, both F) seem to represent hybrids with *M. scabra* subsp. *chilensis*. These plants were found relatively far inland in the Río Jequetepeque valley, where the contact zone between the two taxa would be expected.

Mentzelia sericea is found in dry scrub communities, on scree slopes, and in rock falls at elevations of 350–2500 m in northern Peru.

Paratypes. PERU. **Cajamarca:** San Miguel, rd. Chilete to San Miguel, *M. Weigend, T. Henning & O. Mohr* 7468 (BSB, HUT, M, USM); btw. Platanar & Lives (carretera hacia el pueblo Unión Agua Blanca), *E. Rodríguez R. et al.* 2437 (HUT); Cajamarca, rd. to Pacasmayo, 48 km from Cajamarca, *M. Weigend, Th. Franke & J. Skrabal* 98/530 (CPUN, F, M, USM); 1 km S of Jesús, S of Cajamarca, *I. Sánchez V.* 7189 (F); 1 km above San Juan, *I. Sánchez V.* 3849 (F); rd. from Cajamarca to Chilete, Km 70, *N. Dostert* 98/137 (CPUN, F, M, USM); rd. from Chilete to San Bernardino, above Pichana, *J. Cabanillas & J. Guevara B.* 499 (F); Paredones, rd. Chilete to San Pablo, *A. Sagástegui A.* 7914 (HUT, WIS); Asunción–San José, *Sagástegui et al.* 10157 (HUT, MO); Contumazá, near Cascas on rd. from Cascas to Trujillo, *M. Weigend, T. Henning & O. Mohr* 7650 (BSB, HUT, M, USM); 83 km from Cajamarca on rd. to Pacasmayo, *M. Weigend, N. Dostert & K. Drießle* 97/432 (F, HUT, M, NY, USM); Km 85.5 on rd. Tembladera to Chilete, *S. Baldeón* 852 (USM); El Balconcito below San Benito, *A. Sagástegui A.* 16426 (BSB, HAO); La Herilla (Guzmango), *A. Sagástegui A. et al.* 9698 (HUT, MO); San Antonio–Portachuelo (Carretera Ascope–San Benito), *L. López & A. Sagástegui A.* 7921 (HUT); Los Chirimoyos (San Benito–Guzmango), *A. Sagástegui A. & L. López* 10526 (HUT, MO); Cuesta del Espino (San Benito–Hda. San Lorenzo), *Sagástegui* 3749 (HUT); Cushtón (Contumazá–Chilete), *L. Mostacero et al.* 3377 (HUT); San Benito, Las Chirimoyas, Guzmango, *A. Sagástegui A. & S. Leiva* 15535 (F, HAO, M); rd. Contumazá to Chilete, *M. Weigend, N. Dostert & K. Drießle* 97/452 (F, HUT, M, USM); below Cascas, *R. Ferreyra* 19914 (MSB, USM); alrededores Cerro Cuculicote, *L. López et al.* 9264 (HUT); San Pablo, Sangal, *A. Sagástegui A.* 15617 (F, HAO, M); San Miguel, *A. Weberbauer* 3923 (G); Chota, Llama, rd. Llama to Chiclayo, 15 km from Llama, *M. Weigend & N. Dostert* 98/162 (CPUN, F, M, USM). **La Libertad:** Otuzco, Samne at the Otuzco–Huamachuco turnoff, *R. Ferreyra* 7660 (M, MO, USM); Samne, Otuzco, *L. López s.n.* (HUT 987); above Samne, btw. Trujillo & Otuzco, *R. Ferreyra* 14083 (USM); Casmiche (Samne–Otuzco), *A. Sagástegui A. et al.* 11494 (HUT, MO); Trujillo, Plazapampa, *H. de Cevalco s.n.* (M, MO, USM); Trujillo, Cerro Chiputur, *L. López* 373 (USM); Prov. Gran Chimú, planta eléctrica to Tambo La Lima, *A. Sagástegui et al.* 17098 (B, F). **Lambayeque:** Prov. Olmos, 2 km E of Olmos, *A. Gentry* 22590 (USM).

Literature Cited

- Booth, W. E. 1933. Comparative anatomy of *Mentzelia oligosperma* and *M. decapetala*. Kansas Univ. Sci. Bull. 22(14): 439–461.
- Brako, L. & J. L. Zarucchi. 1993. Catalogue of the flowering plants and gymnosperms of Peru. Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1–1286.
- Brown, D. R. & R. B. Kaul. 1981. Floral structure and mechanism in Loasaceae. Amer. J. Bot. 68: 361–372.
- Darlington, J. 1934. A monograph of *Mentzelia*. Ann. Missouri Bot. Gard. 21: 103–226.
- Dostert, N. & M. Weigend. 1999. A synopsis of the *Nasa triphylla* complex (Loasaceae), including some new species and subspecies. Harvard Pap. Bot. 4: 439–467.
- Eisner, T., M. Eisner & E. R. Hoebeke. 1998. When defense backfires: Detrimental effect of a plant's protective trichomes on an insect beneficial to the plant. Proc. Natl. Acad. Sci. U.S.A. 95: 4410–4414.
- Ernst, W. R. & H. J. Thompson. 1963. The Loasaceae of the southeastern United States. J. Arnold Arbor. 44: 138–112.
- Gilg, E. F. 1894. Loasaceae. Pp. 100–121 in A. Engler & K. Prantl (editors), Nat. Pflanzenfam., ed. 1, Div. 3, Vol. 6a. Berlin.
- . 1925. Loasaceae. Pp. 522–543 in A. Engler & K. Prantl (editors), Nat. Pflanzenfam., ed. 2, Vol. 21. Berlin.
- Hiepko, P. 1987. The history of the collections of the Botanical Museum Berlin-Dahlem (B), Part 3: 1913 to March 1, 1943. Englera 7: 219–252.
- Hill, R. J. 1976. Taxonomic and phylogenetic significance of seed coat microsculpturing in *Mentzelia* (Loasaceae) in Wyoming and adjacent western states. Brittonia 28: 86–112.
- Holmgren, N. H. & P. K. Holmgren. 2002. New *Mentzelias* (Loasaceae) from the intermountain region of the western United States. Syst. Bot. 27: 747–762.
- Hufford, L., M. M. McMahon, A. M. Sherwood, G. Reeves & M. W. Chase. 2003. The major clades of Loasaceae: Phylogenetic analysis using the plastid *matK* and *trnL-trnF* regions. Amer. J. Bot. 90: 1215–1228.
- Keeler, K. H. 1981. The nectaries of *Mentzelia nuda*: From pollinator attraction to seed protection. Amer. J. Bot. 68: 295–299.
- Leins, P. & W. Winhard. 1973. Entwicklungsgeschichtliche Studien an Loasaceen-Blüten. Österr. Bot. Zeitschrift 121/122: 145–165.
- Machbride, J. F. 1941. Loasaceae, Flora of Peru 4(1) Publ. Field Mus. Nat. Hist., Bot. Ser. 13: 143–181.
- Pérez-Moreau, R. L. & S. Crespo. 1988. Loasaceae. In M. N. Correa (editor), Flora Patagónica. Colecc. Ci. Inst. Nac. Tecnol. Agropecu. 8(5): 199–217.
- Pinto-Basto, M. F. 1995. Loasaceae. Pp. 1–9 in J. Paiva (editor), Flora de Cabo Verde: Plantas Vasculares. Vol. 33. Instituto de Investigação Científica Tropical, Lisbon.
- Reveal, J. L. 2002. *Mentzelia rhizomatosa* (Loasaceae: Mentzelioideae), a new species from Western Colorado. Syst. Bot. 27: 763–767.
- Ruiz, H. & J. A. Pavón y Jiménez. 1958. Flora Peruviae, et Chilensis 5. Anales Inst. Bot. Cavanilles 16: 399–457.
- Sleumer, H. 1955. Die Loasaceen Argentinien. Bot. Jahrb. Syst. 76: 411–462.
- Solereder, H. 1899. Systematische Anatomie der Dicotyledonen. Ferdinand Enke, Stuttgart.
- Spackman Panjabi, S. C. 2004. Visiting insect diversity and visitation rates for seven globally-imperiled plant species in Colorado's middle Arkansas Valley. Pp. 1–53 in report

- prepared for the Native Plant Conservation Alliance by the Colorado Natural Heritage Program; College of Natural Resources, Colorado State University, Fort Collins, Colorado.
- Thompson, H. J. & W. R. Ernst. 1967. Floral biology and systematics of *Eucnide* (Loasaceae). *J. Arnold Arbor.* 48: 56–88.
- & J. Roberts. 1971. Observations on *Mentzelia* in southern California. *Phytologia* 21: 279–288.
- & J. E. Zavortnik. 1968. Two new species of *Mentzelia* in Texas. *Wrightia* 4: 21–24.
- Turner, B. L. & A. L. Hempel. 1995. A new species of *Mentzelia* (Loasaceae) from Nuevo Leon, Mexico. *Phytologia* 79: 298–300.
- Urban, I. 1886. Die Bestäubungseinrichtungen der Loasaceen. *Jahrb. Bot. Gart. Berlin* 4: 364–388.
- . 1892. Blüten und Fruchtbau der Loasaceen. *Ber. Deutsch. Bot. Ges.* 10: 259–265, Tab. 14.
- & W. Gilg. 1900. *Monographia Loasacearum*. *Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur.* 76(1): 1–368.
- Weigend, M. 1997. *Nasa* and the Conquest of South America. Ph.D. Dissertation, Ludwig-Maximilians-University, Munich.
- . 2000. No. 132. Loasaceae. Pp. 1–92 in L. Andersson & G. Harling (editors), *Flora of Ecuador*, Vol. 64. Swedish Natural Science Research Council, Stockholm.
- . 2001. Loasaceae. Pp. 1–100 in R. Bernal & E. Forero (editors), *Flora de Colombia*, Vol. 22. Instituto de Ciencias Naturales, Bogotá.
- . 2004. Loasaceae. Pp. 239–254 in K. Kubitzki & C. Bayer (editors), *The Families and Genera of the Vascular Plants*, Vol. 6. Springer-Verlag, Berlin.
- & E. Rodríguez R. 1999. *Mentzelia heterosepala*, a new species of *Mentzelia* from the Marañón Valley in northern Peru. *Arnaldoa* 5(1): 51–56.
- , K. Aitzetmüller & L. Bruehl. 2004. The seeds of Loasaceae subfam. Loasoideae (Cornales) I: Seed release, seed numbers and fatty acid composition. *Flora* 199(5): 424–436.